AMERICAN ENGINEER

"THE RAILWAY MECHANICAL MONTHLY"

(Including the Railway Age Gazette "Shop Edition.")

PUBLISHED ON THE FIRST THURSDAY OF EVERY MONTH, BY THE
SIMMONS-BOARDMAN PUBLISHING COMPANY,
83 FULTON STREET, NEW YORK, N. Y.

CHICAGO: Transportation Bldg. CLEVELAND: Citizen's Bldg.
LONDON: Queen Anne's Chambers, Westminster.

EDWARD A. SIMMONS, *President.* HENRY LEE, *Secretary.*
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Subscriptions, including the eight daily editions of the *Railway Age Gazette* published in June in connection with the annual conventions of the Master Car Builders' and American Railway Master Mechanics' associations, payable in advance and postage free:

United States, Canada and Mexico.....$2.00 a year
Foreign Countries (excepting daily editions)..... 3.00 a year
Single Copy ..... 20 cents

Entered at the Post Office at New York, N. Y., as mail matter of the second class.

VOLUME 86. DECEMBER, 1912. NUMBER 12.

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The Burlington Mikados

An order of one hundred locomotives of the Mikado type by the Chicago, Burlington & Quincy is a good indication of the secure position which this type of locomotive now holds on the railroads of this country. This road, like others in the same district, has long stretches of very low grade line and handles large amounts of bulk commodity at moderate speeds as well as perishable products that require high speed. The design of the locomotives selected is evidently well suited to heavy tonnage trains of both kinds, and this large order was placed after experience with 2-8-2 type locomotives of about 18 per cent. less hauling capacity and of Mallets of about an equal percentage greater drawbar pull. On other roads, in both the east and west, the 2-8-2 type has been very satisfactory for work where moderate grades are encountered, and it would seem that this type has sufficient flexibility to allow it to be adapted successfully to a large range of operating conditions, a fact which was never true of the consolidation type.

Chart for Tractive Efforts

The solving of commonly used equations by the graphical method has many advantages. It not only is a great time saver, but largely eliminates the probability of error. The more progressive computers and designers generally prefer data presented in curve form and not infrequently, for their individual convenience, transpose any formula that they frequently use. Among locomotive designers there is probably no formula more generally used than that for obtaining the locomotive tractive effort, and while at first sight this might seem to be a difficult formula to put into convenient and useful graphical form, L. R. Pomeroy has been successful in accomplishing it, as will be seen by reference to page 641. With this chart it is a simple matter to observe the effect of changes in any particular dimension or to work backwards and ascertain the necessary length of stroke, diameter of drivers, etc., to give the desired result. We desire to publish as many simple and practical charts of this character as it is possible to obtain, and would be glad to receive from our readers copies of anything of this kind they may have prepared for their own use, which have not already been published, or suggestions as to formula in common use which it would be advisable to transfer to the graphical form.

Methods in French Work Shops

French locomotives are known to be designed and constructed with great care, and they frequently have been offered as a model for American motive power men. While these facts, in a general way, have been known and drawings showing the details of construction have been available to some extent, there has been practically no information published in English on the exact method pursued in the shops for renewing and repairing the various parts. The article on page 633 describing in detail how piston valves and their bushings are machined and assembled in the shops of the Eastern Railway of France is therefore of special interest. It will be seen that the reputation of the French workman for carefulness and accuracy is not undeserved. It is also evident that the designer is allowed a freedom in his selection of materials and given an opportunity to produce the best machine without unreasonable restrictions as to its cost, a condition which does not hold on all of the roads in this country. There has been considerable discussion as to the causes and remedies for the leakage of piston valves in this country, and it is quite evident that the French railways do not propose to have any trouble of this kind. If the same methods were followed on our locomotives of using a floating valve; boring the valve chamber bushings after they are in place; turning the rings to give equal pressure in all directions and to have a perfect circular fit at the beginning, while leaving them entirely free from the duty of supporting

the valve, and machining all parts to dimensions so accurate that the effect of the expansion of the various metals must be considered, it is quite probable that complaints of leakage in piston valves would be heard no more. A micrometer is a novelty in most American railway shops, but it is evident, from the account of doing this work, that it is a commonly used instrument with the French workman. It must be recognized that extreme accuracy on locomotives is an extravagance in some cases, but in other particulars it is a decided economy, although its first cost, like many other economical features, may seem to be very high. It may be that the French methods are more accurate than good business policy dictates, but it is equally possible that American shop methods may be in error on the other side.

Entertainment at Atlantic City Conventions

Now that it has been decided to again hold the Master Car Builders' and Master Mechanics' conventions at Atlantic City, the subject of what changes, if any, should be made in the entertainment features is being given considerable attention. The radical change made last year in these particulars has brought forth a number of suggestions for still further improvement. The changes that have been made are conceded by all to be based on the right principle, and while the net results were subjected to some unfavorable criticism the causes seem to be all of minor importance; even the strongest champions of the new plans admit that some improvement is possible, however, and it is quite probable that some alterations in the arrangements will be made this year. The whole subject was very frankly discussed in the June 19, 1912, issue of the *Daily Railway Age Gazette,* published at the closing of the convention, and it was truly stated that "the one principle to be borne in mind is that everything else should be made decidedly subsidiary to the business purposes of the associations. The sessions of the conventions come first and full opportunity to study the exhibitions comes next in importance, and whatever to any considerable degree interferes with these things or may be construed as interfering with them, should be frowned down." In the same article there were some excellent suggestions as to improvements in the entertainment features which we believe the entertainment committee would do well to carefully consider. The most important of these is, that all the social features should be held in the evening on the pier and that all exhibits should be kept open during the evening. It is very truthfully stated that practically every other industrial exposition in the United States, whether it be the Railway Appliance Association exhibit in Chicago, or an automobile or agricultural show, is held open during the evening. As an argument it is pointed out that every railroad man who attends the convention does not want to dance, and if the exhibits are kept open in the evening and all the social affairs are held on the pier, those who prefer looking over the exhibits to the social functions would have an opportunity of so doing. Furthermore, many railroad men spend only a day or two at the conventions and they would no doubt welcome as a great improvement the innovation of keeping the exhibits open at night. It has been felt by many of the exhibitors that the benefits accruing from their exhibits hardly justify the expense, this being due principally to the small amount of time allowed the members, who are regular attendants at the meeting, for carefully inspecting the exhibits. On the other hand, and for the same reason, the attendance at the meetings has been affected. If the exhibits are held open in the evening the time available for inspecting them will be increased 50 per cent. to those railroad men who attend all of the meetings. The expense for lighting would not be prohibitive, and the opportunity for more leisurely examination would be most beneficial to both the exhibitor and the railroad man. Arrangements can undoubtedly be made so that only part of the men employed by the exhibitors will have to be on duty during the evening and they can be relieved during part of the day.

$50 for the Best Car Article

No one can question the great importance of the car department in railway operation. This is especially so when it is recalled that there are about 40 cars in service for every locomotive, representing probably a greater capital investment than for locomotives; that it costs about as much to maintain them, and that the possibilities of reducing the amount of damage to lading by better design and construction are very great. A slight mistake in design may cause an increase of a few cents, or a dollar or so, in making repairs to a certain part, but the number of cars in an order is usually so great that the sum total to be expended is a large item, although there is no way of checking it up so that it can be forcibly presented to those in charge of buying or designing the cars. Beginning with the January, 1913, issue we propose to devote much more attention to car department matters than we have in the past—in fact, the intention is to have a department devoted entirely to that subject. Unfortunately car department readers are far behind their brothers in the locomotive department in contributing to our columns, and therefore we shall try to encourage them by offering a first prize of $50 for the best article on freight car design submitted before February 15, 1913. A second prize of $25 will be given, and any other contributions which are accepted for publication will be paid for at our regular space rates. The article may consist either of a discussion of the methods of design or it may be written by the practical man, not a designer, calling attention to features which should be considered by the designers, but that are often overlooked by them because of their lack of familiarity with the practical conditions under which the cars are to be used, repaired or maintained. Thousands and thousands of dollars have often been expended by the railroads for repairs which would have been entirely unnecessary if the designers had been more familiar with these conditions. And yet, because of the fact that the repairs were made a few at a time at various points throughout the country, and only cost a small amount for each car, and because of the difficulty in getting an exact estimate of the total amount of repairs for any one part, the officers have not realized the seriousness of the mistake. Moreover the average designer and many of the men who control the specifications for the cars have not had an adequate idea of the necessity for making the cars water, burglar and leakage proof. What suggestions can you make to secure better results? What methods of design have you developed either to make the car or its parts of proper strength and durability, or to design the car in such a way as to prevent damage to the lading. Note that the competition is open to both the designer and the practical man—the first to tell how it should be done from his standpoint; the second to tell where the designer has fallen down and what he should look out for to get better results. Possibly the designer is not given a fair chance? If so, what should be done to insure better results and where does the trouble lie?

A. S. M. E. Code for Locomotive Tests

In 1909 a committee on power tests was appointed by the American Society of Mechanical Engineers, and given the duty of revising and extending the present test codes of the society relating to power plant apparatus. This committee has presented a preliminary report which is published in the November issue of its Proceedings and will be presented at the annual meeting this month. Twelve codes for testing individual apparatus are presented in the second part of the report, the first part being devoted to standards and general matters. Among these is a code for locomotive tests which contains some suggestions that will probably arouse

considerable discussion. Codes are given for what are termed shop tests, or tests made where the power is absorbed by a brake, and for road tests where the locomotive is in regular operation on the road. Under the latter head the proposed code provides that the fire shall be thoroughly cleaned, ashes and refuse removed from the smoke box and ash pan, and the fire burned down as low as possible just before the locomotive leaves the engine house. The average thickness of the firebed is to be then noted as well as the steam pressure, water level and the time, and it is to be considered that this is the starting time of the test. Weighed coal is then to be used and the regular work of the test started. It is provided that the water data only shall be taken just before the train starts. As the end of the route is approached the fire shall be burned down to such an extent as to leave, as near as practicable after cleaning, the same amount of live coal on the grate as that observed at the start. On reaching the terminal, the steam pressure, water level and time are to be noted and the test is then completed. Practically the same conditions and provisions hold for the shop tests.

For road test the code provides that the length of time on which the hourly rates of combustion and evaporation are based is the total time that the throttle valve is open and not the elapsed time between the starting and stopping times.

It would seem that both of the features just mentioned should be subject to more elaborate treatment, especially in connection with the tests of freight locomotives which not infrequently consume considerable fuel while standing on side tracks. Provision should be made for deducting this as well as the fuel consumed by auxiliaries, if the hourly rate of combustion is based only on the time during which the throttle is open. It is specified in the proposed code that the dimensions of heating surface of boilers and superheaters are those surfaces in contact with the fire or hot gases. In this connection it should be remembered that the amount of heating surface given in published descriptions of locomotives and in the data from locomotive builders is measured on the outside of the tubes between the tube sheets or, in other words, is the area of the tube in contact with the water. The firebox heating surface, however, is usually based on the fire side of the sheet, and includes the heating surface of the back tube sheet.

The standard units on which to base the various measures of capacity as recommended are, for boilers: "One pound of water evaporated into dry steam from and at 212 deg. per hour." For locomotives, "One indicated horse power developed in the main cylinders," and "one dynamometer horse power delivered to the drawbar."

The recommended standards of efficiency and economy for locomotives are as follows: Pounds of dry fuel per i. h. p. per hour and per d. h. p. per hour; pounds of dry steam per i. h. p. per hour, and per d. h. p. per hour and pounds of dry fuel per ton-mile.

The report is accompanied by thirty-four appendices, giving detailed instructions as to the methods to be pursued in using the various pieces of apparatus and in the location of apparatus and instruments for locomotive tests. It is directed that the water meter should be attached to the suction pipe of the injector at a point where it can be conveniently read when the train is in motion. A check valve should be provided to prevent hot water backing through it when starting and stopping the injector. It is recommended that a rod be attached to the reverse lever and carried forward to the observation box on the pilot, where a scale should be provided to show its position. It further states that a rod should be likewise connected to the throttle valve lever for the same purpose. For giving the temperature in the front end a bulb thermometer reading to 1,000 deg. Fahr. and inserted so that the bulb occupies a position below the top of the exhaust nozzle and between it and the front tube sheet, should be used. For temperatures over 2,000 deg. Fahr. an optical, pneumatic or radiation pyrometer is specified.

NEW BOOKS

Boundaries and Landmarks. By A. C. Mulford. Cloth bound, 5½ in. x 8 in., 89 pages, 19 illustrations. D. Van Nostrand Co., New York. Price $1.00.

This work is unique among books on surveying in that it does not describe methods of measuring boundary lines, but discusses the establishing of new landmarks and the finding of old ones. It is intended to familiarize the surveyor with the different types of old boundaries that exist throughout the country. The author has not tried to write a handbook, the style of the work being suggestive rather than specific.

Mechanical World Pocketbook, Diary and Year Book for 1913. Illustrated. Bound in cloth, 330 pages, 4 in. x 6 in. Published by Emott & Co., 65 King street, Manchester, Eng. Price, 16 cents.

In this, the twenty-sixth edition of this pocketbook and diary, several new sections have been added and a number of others have been completely revised. New data and tables will be found in the section on gas engines, while that on oil engines has been greatly extended, particularly in connection with the Diesel engine. There is a new section on heat and another on chain driving. Spiral gearing is also the subject of a new section. A diary and memorandum for 1913 follows the reference section.

Comparative Trials of Gasolene and Alcohol Internal Combustion Engines. By R. W. Strong and Lawson Stone. Illustrated. Bound in paper, 243 pages, 6 in. x 9 in. Published by the Bureau of Mines, Department of the Interior, Washington, D. C.

A complete account of the work of the Bureau of Mines in connection with the testing of the comparative fuel values of gasolene and denatured alcohol in internal combustion engines will be found in this bulletin (No. 43). The tests were very elaborate and the report contains the full data which is shown both in tabular and curve form. The net results of the tests indicate that denatured alcohol gives the greater efficiency.

Railway Tool Foremen's Association. Proceedings of the fourth annual convention. Illustrated. Bound in paper, 109 pages, 6 in. x 9 in. Published by the American Railway Tool Foremen's Association, A. R. Davis, Secretary, Macon, Ga. Price, 50 cents.

At the fourth annual convention of this association, held in Chicago, July 9-11, 1912, papers on Milling Cutters and Reamers; Standardization of Carbon Tool Steel; Tempering of Tool Steel in the Electric Furnace; Standardization of Steel for Small Tools, and Checking Shop Tools were presented for discussion. The full text of the papers and of the discussion, as well as the report of the secretary and treasurer, a list of the officers and the members of the various committees are given in this volume. Topics for discussion at the next convention have been selected, and are published therein, as well as a complete list of the members of the association, with their addresses.

Railway Master Mechanics' Association. Proceedings of 1912 convention. Illustrated. Bound in cloth, 432 pages, 6 in. x 9 in. Published by the American Railway Master Mechanics' Association, J. W. Taylor, Secretary, 390 Old Colony building, Chicago. Price, $2.50.

The reports and papers presented at the last annual convention, together with a full verbatim account of the discussions, are given in this volume. These cover the following subjects: Cast Steel Locomotive Frames; Contour of Tires; Design, Construction and Inspection of Locomotive Boilers; Engine Tender Wheels; Flange Lubrication; Main and Side Rods; Maintenance of Superheater Locomotives; Mechanical Stokers; Requirements for Headlights; Safety Valves; Standardization of Tinware, and Steel Tires. Full specifications and drawings of the standards of the association are included, as well as a list of the members and their addresses. The officers, members of committees to report at the next convention and the subjects to be discussed, as well as the constitution and by-laws of the association, form part of the volume.

ELECTRIC SYSTEMS FOR TRAIN LIGHTING

"Light Failures on Well Maintained Electric Service Now Average in the Neighborhood of 1 Per 1,000,000 Miles."

The following account of the electric systems used for train lighting in this country is taken from a paper on Train Lighting, which was presented before the Railroad Sessions of the annual meeting of the American Society of Mechanical Engineers, held in New York on Thursday morning, December 5, by H. A. Currie, of the New York Central & Hudson River, and Benjamin F. Wood, of the Pennsylvania Railroad. The first part of the paper was given over to a review of the subject of train lighting from the time candles were used to the present day. The methods employed are given in historical order and comprise the candle, oil, gas and electric lighting systems. The systems appear to occupy a period of 25 years each, beginning with candle lighting in 1825. The early methods of candle and oil lighting are described in brief outline. The gas lighting period is gone into more fully and the systems in general use are described. Then follows in still more detail a consideration of the electric lighting period, from which the following is taken:

Early in 1881 the London, Brighton & South Coast had in operation a straight storage battery system with a battery under each car, the battery being charged during the layover period at terminals. Bichromate primary batteries were tried on trains in France during the year 1885. The scheme was abandoned, however, when the first set of batteries had run down and renewal of the electrodes and acid was necessary. About this time both the Pennsylvania Railroad and the Boston & Albany tried out the straight storage system. The general opinion was that the system was practical, but too expensive for general use.

In 1888 the Chicago, Milwaukee & St. Paul had in service a train equipped with a head-end system consisting of a boiler, engine, generator, etc., installed in a separate car for supplying light to the train. The present system, developed later, uses steam from the locomotive.

The axle driven generator was developed coincidently with electric lighting. The first installation of this kind consisted of a generator connected to a relatively high capacity battery and hand-operated main switch and pole changer, regulation being effected through the inherent regulation of the batteries taking the excess current at high speeds, thereby holding the voltage nearly constant by armature reaction. Later the brushes were automatically shifted with the speed for voltage regulation. The next step was to allow the belt to slip at speeds in excess of the speed required to deliver current at normal voltage.

STRAIGHT STORAGE SYSTEM.

In this system, each car is provided with a storage battery, which must be charged at terminals during the layover period. A consideration of the requirements for successful operation reveals the following essentials: The capacity of the battery must be in excess of the demand for current to operate lamps, fans, etc., for the longest run between charging periods. The power plant, or other outside source of power, must be of sufficient capacity to meet the maximum demand for charging current. The layover time at terminals must be sufficient to cover all necessary shifting and charging of the batteries at the proper rate. The yard must have a sufficient number of tracks provided with charging outlets, so arranged that the charging of batteries will not interfere with shifting operations.

Two considerations enter into the determination of the size of the battery—the demand for current and the weight of the battery. The demand for current will vary with the type of car used, the number and size of lamps and other electrical apparatus installed and the time during which this apparatus is used. The battery must be divided into units of a weight that may be readily handled. The batteries in general use in train lighting service have a rated capacity of approximately 300 ampere-hours. This is about the maximum limit of capacity for Plante's type batteries having weight low enough for convenience in handling. The great majority of cars on which this system is used are equipped with a 64 volt lead-lead, or nickel-iron battery with cells connected in series. A few cars are operated at other voltages, viz., 26, 30, 32 and 110. Two battery boxes are generally provided and secured to the under side of the car, one on each side equidistant from the ends of the car, and with the front or door side slightly back of the line of outside finish. The cells are put up in double compartment, lead-lined wood tanks provided with handles, rollers, etc., for convenience in handling. The two halves of the battery are connected in series and leads are run to the switchboard in the end of the car. Taps are taken off these leads at the battery terminals and run to charging receptacles, conveniently located on each side of the car.

The ampere-hour meter is coming into general favor as an indicator of the state of charge of the battery. As an adjunct a shunt trip circuit breaker is sometimes installed, the connections being such that, when the battery is fully charged, the pointer on the meter closes a circuit which energizes the shunt trip and opens the breaker, thus cutting the battery off charge. The source of power available for charging purposes at terminal yards must be of the proper voltage and of capacity sufficient to meet the maximum demand. The charging voltage provided is usually 50 per cent. higher than the normal voltage of the battery. Hand or automatically operated resistance devices are provided for reducing the voltage of the individual charging lines to the proper point. The batteries are charged while on the car under normal conditions. When the layover period is short it is sometimes necessary to exchange a discharged battery for one fully charged.

The operating schedule of cars equipped with this system must be worked out to allow sufficient layover at terminals to permit the charging of batteries and shifting of cars. Anything that

TABLE 1.—COSTS OF VARIOUS SYSTEMS OF PASSENGER CAR ILLUMINATION.

	1825–1850 Candles	1850–1875 Oil	1875–1900 Gas			1900 Electric		
			Gasolene	Pintsch	Acetylene	Head-End	Straight Storage	Axle Coach
Passengers carried	4–20	20–50	50–60	60–70	60–70[1]	30–40	[1]40–50	60–70
Candle Power	4–10	20–60	200	300	400	350	250	450
Fixtures and Connections.	0 to $3	$10–$60	$500	$400	$500	$700[3]	$600	$1000
[2] Cost of Plant	.....	.....	...	60[4]	$40	25	20	....
[2] Yearly Operating Cost	15–25	40–120	150	150	$200	750	500	200
Yearly Haulage Cost	.....	.....	150	200	$200	400	300	400
Interest, Insurance and Taxes	.....	.....	50	50	$60	100	62	145
[4] Total Yearly Cost	20	60–100	350	400	$500	1250	1350	750
Cost per Year per Seat	1	1 50–2	6	7	$8	31	34	12

[1] At the time of the prevalence of these systems only limited trains were so equipped.
[2] Including all maintenance.
[3] Share per car considering whole train.
[4] Average
[5] Based on capacity for 500 cars.

Basis for above figures, Passengers Carried suppose all seats to be occupied. The Fixtures and Connections are in nearly every case from actual installations. Cost of Plant is the first cost divided by the capacity in number of cars supplied. Yearly Operating Cost includes fuel or power and attendance and maintenance but not all are actual costs, but are filled out by close estimates. Yearly Cost per Seat is simply an arbitrary means of comparing cost per passenger.

restricts the shifting operations necessitates either additional yard trackage, additional motive power, or both. As cars produce a revenue only when in service, it is the aim of the transportation department to decrease the layover period to a minimum.

HEAD END SYSTEM.

The head-end system consists essentially of a steam-driven generator located in the baggage car or on the locomotive. Proper controlling apparatus is provided and train lines are run from the generator through the entire length of the train, flexible connections being used between cars. It comprises the following apparatus: A generator, usually steam turbine-driven, placed in the baggage car or on the locomotive, and furnished with steam from the locomotive; the necessary indicating, regulating, and controlling apparatus placed near the generator and in an accessible position; train line wires of the proper size on each car and running the entire length of the train, flexible connections being made between cars, in the vestibule; batteries, consisting of a suitable number of cells connected in series and placed in battery boxes attached to the under side of the cars; lamp regulators are sometimes installed in the cars to compensate for the line drop and to maintain constant voltage at the lamps.

The successful operation of this system requires that a sufficient amount of steam at the proper pressure be provided when lighting is necessary. As it is the object of the transportation department to get trains to their destination on time, lack of steam is felt first by the lighting system, the pressure being reduced or steam cut off entirely so that the schedule may be maintained. When the train is broken-up en route, it is obvious that each section must either be equipped with a battery to insure light until the train is again made-up, or provided with some auxiliary light. A member of the train crew must be capable of operating the generating apparatus and of making running repairs and adjustments en route.

Head-end systems are generally operated at 64 or 110 volts, although in late years the introduction of tungsten lamps has gone a long way to eliminate the need of the high voltage equipments and comparatively few railroads are now using 110 volts. It is apparent that the use of the head-end system must be restricted to a few trains having assigned runs or that it must be extended to cover all the cars operated by the railroad in electrically-lighted trains.

AXLE GENERATOR SYSTEM.

The axle generator systems used in this country comprise the following principal parts: An axle-driven generator mounted on the car truck. (Abroad where rigid trucks are used the axle generator is frequently secured to the under side of the car body.) A suspension by which the axle generator is supported from the truck frame. A drive, connecting the armature shaft to the axle. A regulator for controlling the voltage and output of the generator at all train speeds. An automatic switch designed to open on reverse current for the purpose of preventing discharge of the battery through the generator. A regulator for controlling the voltage impressed on the lamp circuits. A battery of a suitable number of cells to supply current when generator current is not available.

For the successful operation of the system, the following requirements must be met: The polarity of the generator terminals must remain unchanged with a movement of the car in either direction. At all train speeds, from the cutting-in speed of the generator to the maximum, the generator output and voltage must be maintained within the desired working limits. The generator must be automatically connected and disconnected from the battery circuit as the train speed rises above or falls below the critical speed. The lights may be burned at any time and the transfer of this load from the battery to the generator and vice versa must result in no appreciable change in the candle power of the lamps. The voltage impressed on the lamp circuit must be maintained within such limits as will give satisfactory illumination and reasonable life of lamps.

The early axle generators were practically all of the constant current type. The generator maintained a constant current, and only that portion went to the battery that was not required by the lights. The generator output could be varied by hand adjustment, and it was necessary to adjust the generator output so that there would be an approximate balance between the battery input and battery output, account being taken of the battery ampere-hour efficiency. This requires consideration of both the ampere capacity of the generator, and the ampere-hour demand during the trip. The demand varies with the number and size of lamps installed, the run in which the car is operated, the number and duration of stops, and the proportion of total running time of the train below cutting-in speed. A change of the car from local to through service, or vice versa, required a complete readjustment of the regulation. A failure to so readjust would quickly result in battery deterioration, the plates becoming sulphated with a low generator output, while a corresponding high output would boil away the electrolyte. In a variation of this method the battery was charged at a definite rate, generally the normal charging rate, while the generator output varied with the lamp load. In more recent systems constant current is maintained until the generator voltage, increasing as the counter e. m. f. of the battery, reaches a definite value, after which one of two results will obtain, depending upon the design of the control apparatus. In one the generator voltage is held approximately constant producing what is known as the taper charge or a gradual decrease in the rate of charge. In the other, the generator voltage is automatically reduced to the "floating" e. m. f. of the battery and maintained approximately constant. This is known as "stop charge" regulation.

Both methods originally depended upon the operation of a voltage coil actuating a switch, which in turn changed the field current by means of resistance. Premature closing of the battery stop charge switch resulted in undercharging and consequent sulphating, while delayed closing caused overcharging and the boiling away of the electrolyte.

These devices are being superseded by a system using a voltage coil in the regulator instead of the voltage switches previously mentioned. Here the current output is maintained constant to the full generator capacity regardless of the current demand, and the battery must supply all current in excess of the capacity of the generator. As the battery becomes charged the generator voltage gradually increases and at a predetermined voltage the voltage regulating coil takes the control of the generator from the current regulating coil and when the battery becomes fully charged the current decreases until the battery is "floating on the line." As the voltage on the battery on charge is approximately 30 per cent. higher than on discharge, it is necessary to provide some means of lamp regulation in order to keep a constant voltage on the lamps. In the early axle generating systems this was accomplished by introducing a fixed metallic resistance into the lamp circuit at the instant the automatic switch closed transferring lamp load from battery to generator. This method, however, was not altogether reliable as the generator voltage varied with the condition of the battery and the number of lamps burning. The variation of the voltage due to these conditions soon led to the development of a variable metallic resistance in place of the "fixed" resistance. In this method of regulation the amount of resistance in the circuit was varied by means of the operation of a small auxiliary motor operated by a voltage relay or other means.

A later type of lamp regulator employed, as a means of regulating resistance, a series of carbon blocks, the resistance being varied by varying the pressure on these blocks, the variation of pressure being determined by a pilot voltage coil connected across the lamp mains.

In this country it is the general practice to support the axle

generator from the truck frame. When first applied, the generator was placed between the axle and the truck-end sill, this arrangement being known as "inside suspension." The generator was not easily accessible for inspection and repairs, and at the present time it is placed outside of the truck frame, this arrangement being known as "outside suspension." There are four general methods of carrying the generator from the suspension framing, viz., bottom pivoted, top pivoted, parallel link and sliding. The bottom pivoted was first used, but at the present time the parallel link suspension is in more general use.

The drive usually used employed a rubber-filled canvas belt running on pulleys on the axle and the armature shaft. The axle pulley as first used was cast iron mounted directly on the car axle, the bore of the pulley conforming to the taper of the axle, but on account of inequalities in the axle which was hammered or rough-turned, it was wrapped with tarred paper. The axle pulley at present in use is of pressed steel, mounted on a steel bushing, the bushing being secured independently to a turned seat on the axle, and the pulley mounted thereon. Belt tension is provided by means of springs which also afford relief to the belt due to the movement of the car axle with respect to the truck frame. One spring is generally used when the generator has top, bottom or sliding suspension and two springs with the parallel link suspension. Chains of the silent type have also been tried and have the advantage of positive action and decrease in bearing pressure, but the wear of the links both on the face and the pivot sprockets has been excessive. Belts of V section have been tried and would seem to have the same advantages as the chains, but it is found that in winter the bottom of the V groove in the sheaves packs with ice and snow, and driving power is lost. Neither the chain nor V belt requires a tension device.

A form of shaft drive, from a bevel gear on the car axle, through an extensible shaft with universal couplings to a generator carried from the car body, is being tried. A gear drive, with the generator mounted on the car axle after the manner of the street car motor mounting has also been prepared and will soon be tried. The latter will no doubt require a track pit for the inspection and repair of the generator.

Plain bearings with ring oilers were used almost exclusively until five years ago. With this method of lubrication, it was necessary to carry the oil level so high that it frequently entered the generator frame and damaged the armature and field coils. To overcome this trouble, a form of wick oiler was tried which, however, proved unsatisfactory. The next improvement was a combination ring and chain oiler, which is now in general use on one type of machine. Waste-packed bearings have also been extensively used and have given no trouble on account of oil entering the generator frame. Considerable trouble, due to hot bearings has been experienced. Ball bearings for axle generators were introduced in England about 1907 and tried in this country in the early part of 1911. Although their use to date has been limited, the indications are that this bearing will become popular on future machines. On account of the widely varying temperatures between summer and winter conditions that obtain in the operation of axle generators, it was necessary

Table 2.—Electric Car Lighting Systems Used on American Railroads.

Railroads	Cars Lighted by Electricity	Cars Lighted by Other Means	Straight Storage		Cars with Turbine	Head-End System		Axle Generator System		Owned and Operated by Railroad Company	Owned and Operated by Pullman Company	Cars Contracted for	Number Cells Lead Battery	Number Cells Nickel, Iron, Alkaline Battery
			No.	Volts		No.	Volts	No.	Volts					
A., T. & S. F.	682	1120	0	0	0	0	0	682	30	632	50	50	11552	25
B. & A.	7	434	0	0	0	0	0	0	0	7	0	0	708	0
B. & O.	246	1105	28	60	11	67	64	19	60	143	103	0	3028	100
	..	..	..	..	..	..	..	29	30	..	..	..	..	..
Can. Pac.	165	2273	0	0	0	0	0	128	24	128	0	37	3072	220
C., St. P., M & O.	58	265	0	0	4	0	64	2	60	2	0	0	192	0
C. of Ga.	6	258	0	0	0	0	0	6	30	0	0	0	80	50
C. & A.	103	100	56	32/64	0	0	0	34	32/64	103	0	0	0	0
C. & E. I.	93	107	2	32	0	0	0	77	32	79	14	0	1264	0
C., B. & Q.	710	591	0	0	52 cr	52	60	2	30	0	0	0	5508	0
	..	..	..	..	16 en	16	64	..	..	..	..	..	..	..
C., M. & St. P.	990	368	30	64	58	58	64	9	64	930		60–64	3872	0
	..	..	..	..	..	..	..	2	32	..	..	..	..	..
C. G. W.	70	102	0	0	0	0	0	70	30	70	0	0	736	216
C. & N. W.	672	1000	0	0	23	200	64	17	60	572	100	0	2200	25
	..	..	..	..	..	..	..	35	30	..	..	..	..	..
C., R. I. & P.	344	805	0	0	0	0	0	301	30	0	0	36–30	5024	125
	..	..	..	..	..	..	..	6	60	..	..	1–60	..	
C., C., C. & St. L.	46	552	2	0	0	0	0	44	32/64	103	0	0	0	0
D., L. & W.	44	738	0	0	0	0	0	44	30	0	30	0	704	0
	..	..	..	..	..	..	..	1	60	..	..	..	..	..
D. & R. G.	30	348	0	0	0	0	0	29	32	0	0	0	512	0
E. P. & S. W.	17	46	0	0	0	0	0	17	30	0	0	0	272	0
Erie.	156	1788	74	30	0	0	0	72	30	146	0	10–30	2448	0
G. N.	551	402	11	110	45	550	110	1	30	953	0	0	3040	0
G. R. & I.	33	86	28	60	0	0	0	1	60	33	0	0	912	0
	..	..	..	..	..	..	..	4	30	..	..	..	..	..
G. T.	106	0	0	0	0	0	0	15	24	31	75	0	840	0
	..	..	..	..	..	..	..	15	30	..	..	..	..	..
	..	..	..	..	..	..	..	1	60	..	..	..	..	..
F. W. & D. C.	22	31	0	0	0	0	0	22	32	0	0	0	336	25
Ill. Cen.	330	770	10	30	0	0	0	320	30	240	90	0	2240	3050
	..	..	..	..	..	..	..	3	60	..	..	..	..	..
K. C. So.	21	57	0	0	0	0	0	18	30	0	0	0	384	0
L. V.	219	340	0	0	0	0	0	196	32	0	0	23–30	3480	24
L. I.	113	404	3	64	0	0	0	109	32	0	0	0	3680	125
L. S. & M. S.	139	634	0	0	0	0	0	72	30	0	0	0	0	0
	..	..	1	64	..	..	..	47	60	..	..	..	3312	..
L. & N.	67	558	1	32	0	0	0	59	32	0	0	532	1120	75
M. P.	208	739	1	32	0	0	0	109	32	0	178	0	1824	0
M. & O.	6	119	0	0	0	0	0	6		6	0	0	0	0
M. & St. L.	19	76	0	0	0	0	0	19	32	17	2	0	304	0
M. C.	60	438	0	0	0	0	0	18	60	0	0	12–30	1248	0
	..	..	..	..	..	..	..	30	30	..	..	..	..	..
M., St. P. & S. St. M.	65	328	0	0	0	0	0	65	32	0	20	0	1072	0
N.Y.C. & H.R.	376	528	0	0	0	0	0	376	32–64	376	0	48	6624	54
N.Y.C. & St.L.	2	..	0	0	0	0	0	2	60	0	0	0	64	0
N.Y., N. H. & H.	330	2103	0	0	0	3	110	113	30	330	0	36–60	7280	270
	..	..	..	..	..	..	..	178	60	..	..	..	..	..
N. P.	667	492	0	0	53	658	64	9	64	0	0	0	28621	0
N. R. of Mex.	36	..	0	0	0	0	0	31	32	9	22	5	592	0
N. & W.	77	382	0	0	0	0	0	13	30	13	30	64	0	1600
O. S. L.	84	198	1	32	6	82	64	1	32	282	82	23	480	0
O. R. & N.	56	55	0	0	7	55	64	1	60	131	0	0	436	0
Pullman.	2400	1864	6	0	0	0	0	2400	30	0	0	0	38400	0
P. & L. E.	4	134	1	60	0	0	0	2	30	0	0	0	96	0
	..	..	1	30	..	..	..	..	..	..	..	..	..	..
P. M.	102	259	0	0	0	0	0	102	32	102	0	0	1632	0
St. L. & S. F.	246	388	0	0	0	0	0	236	32	0	76	10	3820	0
St. L. & S. W.	15	208	0	0	0	0	0	4	60	0	11	0	304	0
	..	..	..	..	..	..	..	11	30	..	..	..	..	..
So.	258	..	0	0	0	0	0	228	30	0	0	30	4128	0
S. P.	145	1400	2	0	0	71	64	72	32/64	145	0	0	2200	0
S. P., L. A. & S. L.	76	97	1	0	0	55	64	20	32/60	24	0	0	608	0
T. & N. O.	76	533	0	0	0	0	0	16	64	16	47	0	512	0
T. & B. V.	16	12	0	0	0	0	0	16	32	0	0	0	176	125
U. P.	221	346	0	0	32eng	202	63	13	64	221	0	44	2020	64
	..	..	..	..	..	..	..	6	32	..	..	..	..	..
W. & L. E.	4	72	3	0	0	0	0	1	.	4	0	0	0	0
W. P.	86	..	0	0	0	0	0	85	32	0	0	0	0	0
	..	..	..	..	..	..	..	1	64	87	..	..	1392	..
Penna. East.	1092	2310	845	60	0	0	0	19	60	1226	0	489	53632	2550
	..	..	..	..	..	..	..	228	30	..	..	..	..	
Penna. West.	581	717	526	60	0	0	0	5	30	581	0	54	22592	50
	..	..	..	..	..	..	..	50	60	..	..	..	..	..
Vandalia.	53	116	42	60	0	0	0	11	60	53	0	0	2128	0
Wabash.	..	..	..	..	..	..	..	..	..	..	..	..	..	..
Total, June 30, 1912.	13786	29275	1680	..	307	2069	..	7060	..	7847	1330	1849	242932	8817
Total, June 30, 1911.	11017	33634	1372	..	192	3185	..	5900	..	..	..	..	202744	..

to develop special oils that would remain fluid at low temperatures. Those now used have a freezing point of 10 deg. Fahr. For ball bearing lubrication grease should be free from acid or alkali; should not oxidize or evaporate; should not gum or lose its body.

LAMPS AND VOLTAGE.

The early train lighting lamps were of the ordinary multiple burning type regularly manufactured, and as the demand increased manufacturers took up the development of lamps especially adapted to train lighting. One of the requisites of these lamps is that the smallest size bulb consistent with reasonable life of lamp be used. Among the early lamps was a foreign-made carbon-filament lamp operating at 4 watts per c. p. Some time later, a carbon lamp operating at 3.5 watts per c. p. was developed by American manufacturers.

It was found that the future of electric car lighting depended to a large extent upon whether or not lamps of still higher efficiencies could be manufactured in large quantities. About this time the tungsten lamp was introduced in regular multiple burning service and investigations were immediately started with a view to adapting it to car lighting. The use of tungsten lamps, however, was looked upon with some doubt on account of the extremely fragile nature of the filament, especially in the smaller sizes. Eventually a 25-watt lamp was developed. This did not improve conditions appreciably, since many of the carbon-filament lamps were approximately of the same wattage. Further investigations resulted in the development of a 15-watt lamp which improved conditions sufficiently to warrant its use in large quantities, and made it possible to light a car at a reasonable current demand. With the introduction of tungsten lamps the standard voltage of axle generators has been changed from 60 to 30 volts.

Coincident with the introduction of tungsten lamps into train lighting service there was introduced the so-called "hot filament" system. The basis for this system was the belief that a tungsten filament of the early type when heated to about 400 deg. Fahr., was less fragile than when cold, so that by maintaining the filaments at this temperature the life of lamps could be materially increased. A circuit switching arrangement was provided whereby the lamps were operated across 30 cells of battery when light was desired and across the two remaining cells of the battery at other times, this being sufficient to keep the filaments at a dull red. Later, the introduction of the drawn wire filament rendered this system unnecessary, and it has been abandoned.

Metalized-filament lamps with small opal bulbs, operating at about 2½ watts per c. p. were developed for berth lighting. These lamps gave satisfaction at first, principally because berth lights had never before been furnished. As the public became educated to their use, the demand for more light in berths became pronounced, so that it has been found necessary to use the 15-watt tungsten lamp as a berth lamp, and the use of metalized-filament berth lamps is decreasing very rapidly.

Tungsten lamps for train lighting purposes are now furnished in 10, 15, 20, 25 and 50-watt sizes, although the bulk of demand is concentrated upon 15 and 50-watt lamps. Spherical bulbs are used almost exclusively, 3¾ in. in diameter for the 50-watt lamp and 2 5/16 in. in diameter for the smaller sizes.

The voltage of the lamps is necessarily dependent upon the voltage of the generating system. An investigation of the records of the principal railroads shows the use of the following voltages at the present time: 24, 26, 30, 32, 60, 64 and 110. The bulk of the demand for train lighting lamps is concentrated on two voltage groups, the 30 volt, which includes lamps between 25 and 34, inclusive, and the 60 volt, which includes lamps of from 50 to 65 volts, inclusive. From an engineering standpoint, it is highly desirable that as many of the voltages, wattages and sizes of bulb as is possible be eliminated. From a manufacturing standpoint, it is desirable that some variation be allowed in the voltages, as a large number of high-voltage and low-voltage lamps are accumulated in the manufacture of lamps of a fixed voltage. This brings up the question of the inspection of lamps before purchase.

On account of the method of manufacture of train lighting lamps, manufacturers have found it most convenient to inspect the lamps for initial variation by holding them at a fixed candle power, allowing the voltage and current to vary. From the railroad standpoint, this method of inspection seems to be wrong, as the voltage of the circuit is maintained at a very closely fixed value in actual service. If the manufacturers could be persuaded to do so, it would be much more desirable to have lamps inspected by holding them at a predetermined voltage, allowing the variations to take place in the wattage and candle power. According to the present method of inspection, a variation of 5 per cent. above and below in voltage and 8 per cent. above in watts is allowed. If the demand is concentrated too greatly upon one type of lamp, it will probably be necessary to increase these limits. On the other hand, if the railroads among themselves can standardize their voltage close enough for each voltage class to permit the use of any of the lamps on any railroad, the demand for any one voltage lamp will probably not be great enough to make the increasing of the limits of inspection above mentioned necessary.

Until recently little attention has been given to the development of reflectors adapted particularly to railroad service. There are several very efficient ones now on the market which in some cases have increased the intensity of the light on the reading plane in a passenger car as much as 65 per cent. without changing the current consumption or the candle power of the lamps. To secure the best results, attention must be given to the proper location of the filament relative to the reflector.

The question of sockets also plays an important part in car lighting. The socket must be sufficiently rugged in its construction to withstand the jar and vibration encountered in the handling of passenger equipment cars. It must also be so constructed that when the lamp is screwed home there will be sufficient spring in the inner shell and contact to lock the lamp in position, holding it so tight that it will not become unscrewed by the jar and vibration.

STANDARDIZATION.

The Association of Railway Electrical Engineers has made recommendations as to the standardization of many of the details pertaining to electric car lighting and a number of the railroads of the country have already indicated their intention of following these recommendations by changing their equipment to conform to the recommended practice. The standard voltages recommended by the Association of Railway Electrical Engineers are: 60 volts (nominal) for straight storage and head-end systems; 30 volts (nominal) for axle generator systems.

The lead battery has been fairly well standardized and the construction recommended includes a two-compartment lead-lined tank with rubber jars. The principal variations from the standard in the lead batteries are that some roads are now using lead covers in place of the rubber covers, this change being made to lessen the danger to battery repairmen on account of gas explosions, and the difference in the method of making the connections to the battery posts. The difference in batteries are not of such a character as to preclude the interchange of batteries on different roads. The nickel-iron battery is manufactured only by one company, and therefore the battery is of standard construction and dimensions.

FOREST FIRES.—The department of agriculture has issued bulletin 117, which is devoted to forest fires, their causes and prevention. It is stated that the average annual number of human lives lost in the United States due to this cause is 70 and that the value of trees destroyed is at least $25,000,000.

ERECTING SHOP KINKS

BY C. A. CURTIS, JR.,
Mt. Clare Shops, Baltimore & Ohio, Baltimore, Md.

AIR RESERVOIR HOIST.

A portable hoist for lifting air reservoir in place is shown in Fig. 1. It is made of telescopic pipe, the larger pipe being 7 ft. long with pointed steel ends riveted in the bottom as shown at *A*. The smaller pipe should be less than 1 in. in diameter and about 6 ft. long, which will accommodate engines with running boards less than 12½ ft. above the track. The reservoir is lifted by a cable; one end is hooked over the running board and the cable is passed under the tank, through a clamp pulley located on the edge of the running board, and

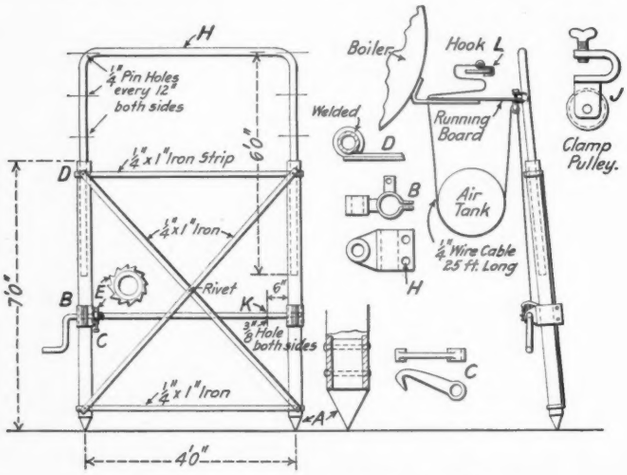


Fig. 1—Hoist for Applying Air-Reservoir Tanks.

is fastened to the rod *K* on which it is wound. This rod or shaft is rotated by a handle. The bearing *B* is provided with a lug to hold the pawl *C* for the ratchet wheel *E*. The left hand bearing is the same as *B* without this lug. They are both clamped to the large pipe by bolts extending through the holes *H*. The smaller pipe is provided with ¼-in. pin holes located 12 in. apart to give any desired height up to about 12½ ft. The braces are fixed to the framework as shown at *D*. This apparatus may be easily handled by two men, and will be found

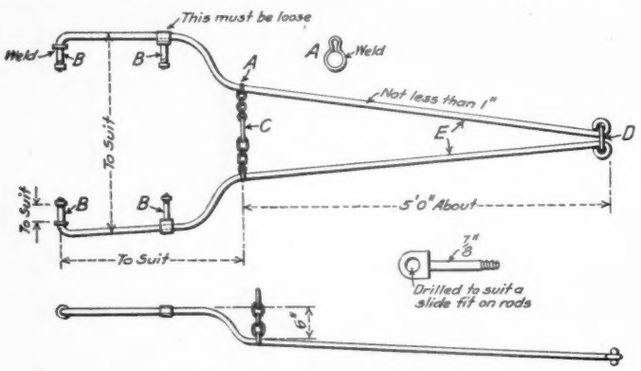


Fig. 2—Device for Lifting Tee-Head to Place.

an improvement over the old method of lifting the reservoir in place by screw jacks, which requires considerable blocking and takes a longer time and more help.

APPLYING TEE-HEAD.

The placing of the tee-head in position in the smoke-box is a hard proposition for two men and an awkward one for three on account of the restricted space. With the device shown in Fig. 2 the work may be done by one man with the help of an overhead crane. It is made of two rods *E* not less than 1 in. in diameter and formed as shown in the illustration. At the wide end the rods are bent and threaded, and fit in the holes in the tee, as indicated in Fig. 3. Collars are welded on the rods to fit against the flange. The other bolts are free to slide on the rods to allow for

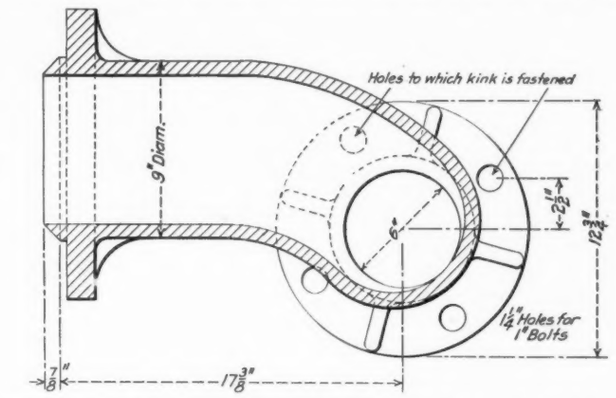


Fig. 3—Tee-Head, Showing the Holes Through Which the Lifting Rods Are Attached.

various sizes of tees. A chain, with an eye *C* for the crane hook is located about 5 ft. from the end of the device, and is welded to the rods at *A*. The rods are held together at the end by a link *D*. With the lifting rods bolted in place the crane hook may be lowered through the smoke stack and hooked into the ring *C*. The workman can balance the whole apparatus at *D* with one hand and signal the crane man with the other, and in this way lift and fit the tee on the stud bolts.

GUARD FOR CHISEL BARS.

The performance of heavy chisel work with a sledge hammer is at its best a rather hazardous operation, for oftentimes the sledge will not hit the chisel squarely on the head and, glancing

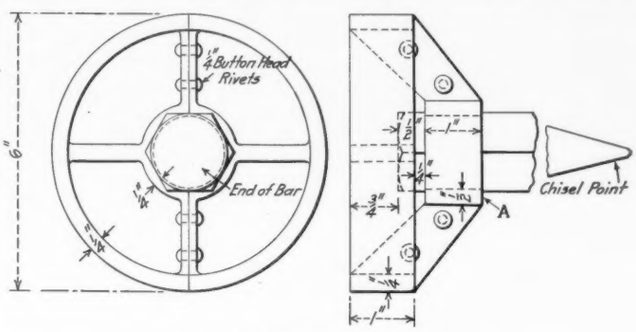


Fig. 4—Guard for Chisel Bar.

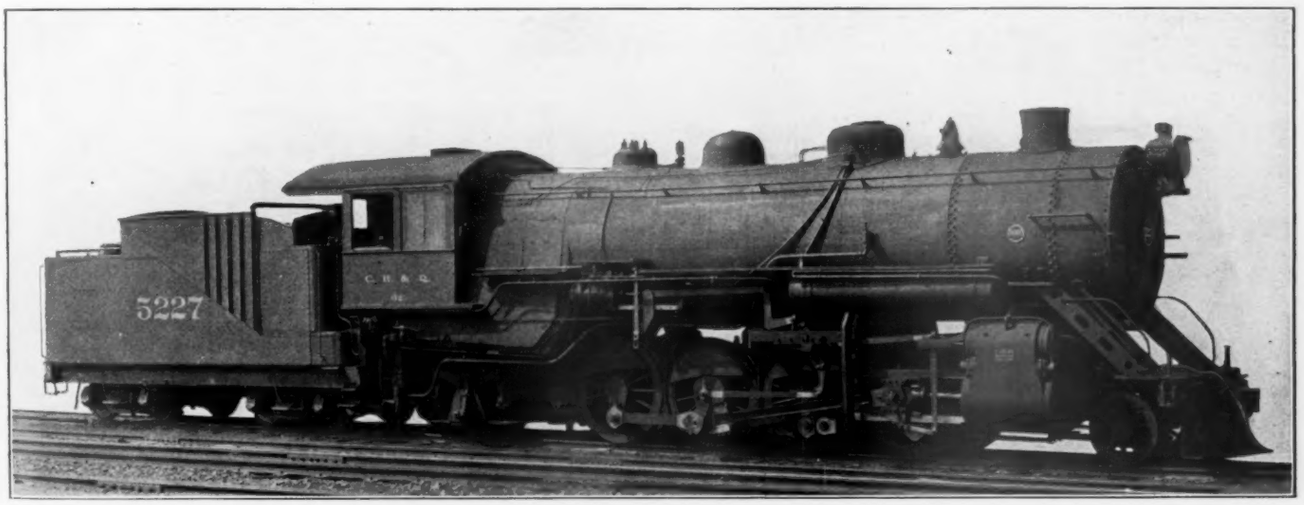
off, is liable to either hit the man holding the chisel bar or cause the man swinging the sledge to lose his balance and fall. For this reason the guard shown in Fig. 4 may be considered a safety appliance. It fits in a recess cut in the bar and the halves are riveted together so that they cannot be taken off inadvertently and mislaid. It is bell-shaped, and should the hammer miss the chisel head it would be caught in the guard, and in this way protect the man holding the bar.

Daylight Working Hours in Honduras.—In Belize, British Honduras, the English "daylight saving scheme" has been put in effect. To more economically adjust the ordinary working hours of the people to the hours of daylight, during the season when days are short, all of the clocks in the city were set ahead twenty minutes; so the amount of daylight time which otherwise might be wasted in the morning in making one's toilet can be availed of after business hours for outdoor games.

MIKADOS FOR THE BURLINGTON

One Hundred Powerful Locomotives of the 2-8-2 Type with Emerson Superheaters Put in Service.

In 1910 the Chicago, Burlington & Quincy received an order of Mikado locomotives from the Baldwin Locomotive Works which have a tractive effort of 49,500 lbs. These locomotives have 27 in. x 30 in. cylinders and carry 170 lbs. steam pressure. The total weight is 271,000 lbs. Within the past few weeks the first of another order of one hundred locomotives of the same type and from the same builders has been put in service. These engines have a maximum tractive effort of 60,000 lbs., an increase of over 21 per cent., as compared with those now in use, which has been obtained, however, with an increase of only about 12 per cent. in total weight. Both classes are fitted with superheaters and, as will be seen in the accompanying table of dimensions comparing these two classes with the engines of the 2-10-2 type which were received early in 1912, the heating surface has been increased over 27 per cent. and the grate area 44 per cent. An increase of one inch in the diameter of the cylinders and of 10 lbs. in the steam pressure increases the maximum pressure on the crank pin by slightly over 14 per cent. The increase of 2 in. in the length of the stroke accounts, however, for the variance between the percentage increase in pressure on the crank pin and of the tractive effort. The diameter of drivers is the same in both cases.

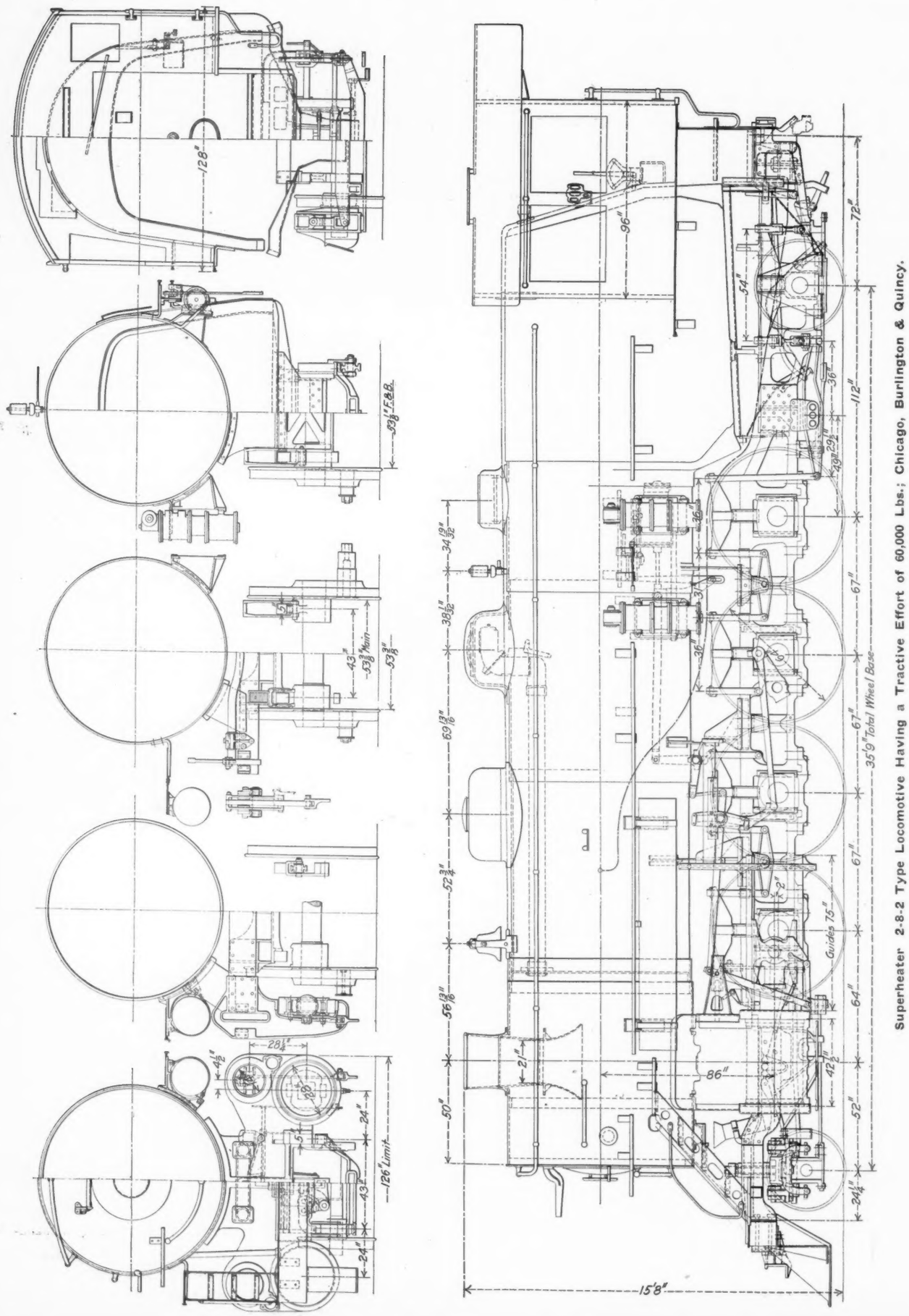


Powerful Mikado Type Locomotive for the Burlington.

In comparison with other locomotives of the same type these new Burlington engines are especially noticeable for their weight when considered in connection with the power delivered. In the accompanying table are shown a number of ratios of this engine compared with four other Mikados and a Santa Fe type locomotive. It will be seen that in percentage of total weight on drivers they are exceeded by one design of the same type, while on the contrary, the average weight per driving axle is the lowest and the tractive effort is as large as any except the Chesapeake & Ohio. If we assume that a maximum indicated horsepower is attained at a 700 ft. per minute piston speed, and that, at this speed, a tractive effort equal to 62 per cent. of the maximum can be obtained, a fair basis for comparison of capacity and power is given. This figure and the speed at which it will be attained is shown in the table. If a further assumption is made that 21 lbs. of water will be required for each horsepower hour a comparison of the boilers can be made and it will become evident if the evaporation per square foot of heating surface is higher than can normally be expected. On this basis it will be seen that all of the locomotives in the table should be able to deliver the power specified for each and that the Burlington engine will require as low a rate of evaporation as any of those shown, with one exception. In the next two items, however, the success of the efforts of the designer are more clearly shown and both the weight on drivers and total weight per horsepower are the lowest of any similar locomotive, being but 93.7 lbs. and

Road	C. B. & Q.	Erie.	C. R. I. & P.	C. & O.	D. L. & W.	C. B. & Q.
Type	2-10-2	2-8-2	2-8-2	2-8-2	2-8-2	2-8-2
Total weight, lbs.	378,700	320,600	318,850	315,000	312,000	303,400
Weight on drivers, lbs.	301,800	237,150	243,200	243,000	236,500	231,000
Per cent. of weight on drivers	79.7	74	76.3	77.1	76	76.4
Average weight per driving axle, lbs.	60,300	59,288	60,800	60,750	59,125	57,750
Tractive effort, lbs.	71,500	57,460	57,100	60,800	57,000	60,000
Maximum I. H. P.*	2,750	2,330	2,470	2,500	2,470	2,470
Speed at which maximum I. H. P. is delivered, m. p. h.	23	25	27	25	27	26
Heating surface, evaporating sq. ft.	5,161	4,155	4,264	4,051	4,859.1	4,627
Heating surface, superheater sq. ft.	970	843	848	845	1,065	961
Evaporative heating surface ÷ superheater heating surface	5.32	4.94	5.03	4.8	4.56	4.82
Evaporation per sq. ft. evaporative heating surface per hour, lbs.†	11.2	11.75	12.15	12.95	10.65	11.20
Weight on drivers per H. P., lbs.	109.5	101.5	98.5	97.3	96	93.7
Total weight per H. P., lbs.	137.5	137.5	129	126	126	122.5
Fuel consumption per hour, lbs.‡	7,210	6,110	6,480	6,560	.....	6,480
Fuel consumption per sq. ft. grate area per hour, lbs.	86	87.5	102.5	98.7	.....	83
Reference in *American Engineer*—month and page	May, 231	Feb., 87	Nov., 563	Mar., 128	Sept., 459	.....

* Taken at 700 ft. piston speed, tractive effort assumed to be 62 per cent. of maximum.
† Steam consumption assumed to be 21 lbs. per H. P. hour.
‡ On the basis of 8 lbs. of water per lb. of coal at speed of maximum horse power.



Superheater 2-8-2 Type Locomotive Having a Tractive Effort of 60,000 Lbs.; Chicago, Burlington & Quincy.

122.5 lbs. respectively. If it is further assumed that 8 lbs. of water can be evaporated for each pound of coal, at the speed corresponding to the maximum indicated horsepower, it is indicated that about 83 lbs. of fuel must be consumed on each square foot of grate per hour, the total fuel consumption per hour being 6,480 lbs. for the Burlington engine.

In many ways these locomotives can be considered as a development based on the design of the 2-10-2 engines, and as far as possible the details on the two classes have been made interchangeable. The boilers have the same outside diameter at the front ring and have the same arrangement of both tubes and flues. The barrel is necessarily considerably shorter and the combustion chamber is eliminated and the tubes have been shortened to 21 ft. The taking out of the combustion chamber made the sloping bottom of the third sheet of the barrel unnecessary and in this case the same diameter is continued to the firebox. This reduction in the width of the back tube sheet made it undesirable to place as many boiler tubes outside the outer row of superheater flues as was previously used and five on each side have been eliminated which accounts for the reduction in the total number of tubes. The mudring is the same width but somewhat shorter than the 2-10-2 type and the wrapper sheet has been carried straight back at the top instead of having a drop of 6 in., as in the previous arrangement. The mudring is 4 in. in width at the back and 6 in. at the front and gradually increases from 4 in. to 6 in. on the sides, this being the same design as previously used. A new feature has been introduced in the shape of an 18½-in. opening for the auxiliary dome

	2-8-2 type. 1910.	2-8-2 type. 1912.	2-10-2 type. 1912.
Cylinders, diameter and stroke, in	27 x 30	28 x 32	30 x 32
Driving wheels, diameter, in	64	64	60
Steam pressure, lbs	170	180	175
Grate area, sq. ft	54.2	78	88
Water heating surface, sq. ft	3,659	4,627	5,161
Superheating surface, sq. ft	693	961	970
Weight on drivers, lbs	207,000	231,000	301,800
Weight, total engine, lbs	271,000	303,400	378,700
Tractive effort, lbs	49,500	60,000	71,500

which permits the boiler to be easily entered for inspection. There are 481 flexible stays used in the sides, throat and back. These are grouped in the usual manner. The inside firebox sheet is in one piece instead of having a separate crown sheet as on the 2-10-2 type. The front end has been made 8 in. shorter, the reduction all being ahead of the center line of the stack.

The cylinders are arranged with inside steam pipes and have an equalizing pipe at the back connecting the two live steam passages, this being the usual way of equalizing the work on the two headers of the Emerson type of superheater with which these locomotives are fitted. The valves are 14 in. in diameter and a Ragonnet reverse mechanism is applied. Although this reverse gear is to be normally operated with compressed air, a steam connection has been arranged for emergency use. The cylinders are fitted with both by-pass and vacuum relief valves. The oil is distributed in the live steam passages, there being no oil connection to the cylinder barrel.

The frames are 5 in. in width with single front sections 11 in. in depth extending under the cylinders. The trailer frames are separate castings. The front deck plate is cast with rear extensions which fit against the inside faces of the front frame sections under the saddle and are secured by the horizontal frame and cylinder bolts. The deck plate has a downwardly extending lug on each side which serves as a support for the driving brake shaft. The brake cylinders are bolted to the main frames just ahead of the first driving pedestals.

All the driving tires are flanged and they are set with sufficient play to enable them to traverse 20 deg. curves. The main axle and the main crank pins are of oil tempered steel. Castle nuts are very freely used throughout the whole locomotive.

A coal pusher is fitted on the tender and cast iron wheels are used under fifty of the tenders. The other fifty have rolled steel wheels.

The general dimensions, weights and ratios are given in the following table:

General Data.

Gage	4 ft. 8½ in.
Service	Freight
Fuel	Bit. coal
Tractive effort	60,000 lbs.
Weight in working order	303,400 lbs.
Weight on drivers	231,000 lbs.
Weight on leading truck	29,400 lbs.
Weight on trailing truck	43,000 lbs.
Weight of engine and tender in working order	480,000 lbs.
Wheel base, driving	16 ft. 9 in.
Wheel base, total	35 ft. 9 in.
Wheel base, engine and tender	67 ft. ¾ in.

Ratios.

Weight on drivers ÷ tractive effort	3.85
Total weight ÷ tractive effort	5.06
Tractive effort × diam. drivers ÷ total evaporating heating surface	809.00
Total evaporating heating surface ÷ grate area	59 30
Firebox heating surface ÷ total evaporating heating surface, per cent.	5.50
Weight on drivers ÷ total evaporating heating surface	49.90
Total weight ÷ total evaporating heating surface	65.50
Volume both cylinders, cu. ft.	22.70
Total evaporating heating surface ÷ vol. cylinders	204.00
Grate area ÷ vol. cylinders	3.44

Cylinders.

Kind	Simple
Diameter and stroke	28 in. x 32 in.

Valves.

Kind	Piston
Diameter	14 in.
Lead	¼ in.

Wheels.

Driving, diameter over tires	64 in.
Driving, thickness of tires	4 in.
Driving journals, main, diameter and length	11 x 12 in.
Driving journals, others, diameter and length	10 x 12 in.
Engine truck wheels, diameter	37¼ in.
Engine truck journals	6 x 10 in.
Trailing truck wheels, diameter	42½ in.
Trailing truck journals	8 x 14 in.

Boiler.

Style	Straight
Steam pressure	180 lbs.
Outside diameter of first ring	88½ in.
Firebox, length and width	117 x 96 in.
Firebox plates, thickness	⅜ & ⅝ in.
Firebox, water space	F.—6; S.—4 to 6; B.—4 in.
Tubes, number and outside diameter	275—2¼ in.
Tubes, thickness	No. 11 B. W. G.
Flues, number and outside diameter	30—6 in.
Flues, thickness	No. 8 B. W. G.
Tubes, length	21 ft.
Heating surface, tubes	4,373 sq. ft.
Heating surface, firebox	254 sq. ft.
Heating surface, total	4,627 sq. ft.
Superheater heating surface	961 sq. ft.
Grate area	78 sq. ft.

Tender.

Frame	12 in. channel
Wheels, diameter	33 in.
Journals, diameter and length	5½ x 10 in.
Water capacity	9,200 gals.
Coal capacity	14 tons

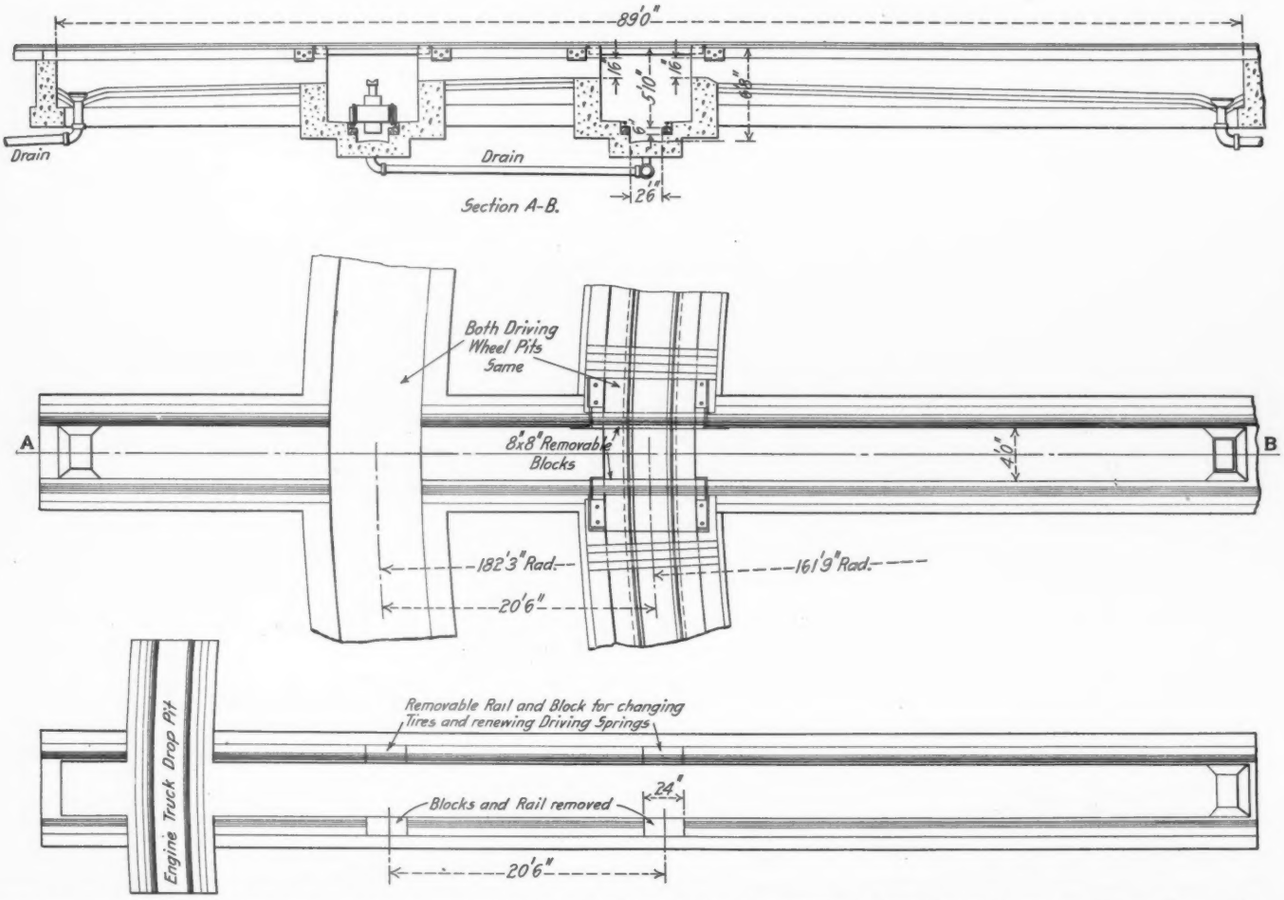
PANAMA CANAL TOLLS.—President Taft has prescribed the tolls for the Panama Canal, in accordance with the report of Prof. Emory R. Johnson, professor of transportation and commerce of the University of Pennsylvania. The rate will be $1.20 for each net ton, 100 cu. ft. of space in a ship being regarded as one ton. Vessels in ballast without passengers will be charged 40 per cent. less than the rate for vessels carrying passengers or freight. Warships other than transports, colliers, hospital and supply ships are to pay fifty cents per displacement ton. Transports and other auxiliaries are to pay $1.20 per ton.

STEEL PASSENGER CAR EQUIPMENT ON THE PENNSYLVANIA.—There are 1,538 coaches and combination coach and baggage cars, 68 dining cars, 144 baggage cars, 159 postal cars, 34 baggage and mail cars, 11 parlor cars, 4 miscellaneous cars and 520 Pullman cars of the all-steel type in service on the Pennsylvania Railroad. In addition there are on order or under construction 296 coaches, 18 dining cars, 25 passenger and baggage cars, 2 baggage cars, 4 postal cars, 38 baggage and mail cars, 10 parlor cars and one office car of the all-steel type. This gives a total of 2,872 all-steel passenger equipment cars in service or on order for this road.

ENGINE HOUSE FACILITIES FOR MALLET LOCOMOTIVES

Two original ideas have been incorporated in the new engine house of the Chesapeake & Ohio at Clifton Forge, Va. The locomotives at this point are very largely of the Mallet type, and the driver drop pits are arranged in pairs so that wheels from either group on the locomotive may be dropped at the same time. The distance between the two drop pits is the same as that between the corresponding wheels in the two groups of drivers.

On some of the other tracks 24 in. sections of the pit rail are cut out and secured to a block and again installed in such a manner that they cannot readily be displaced. This is for convenience in removing or tightening tires, renewing driving springs, etc. The method followed is to block between the driving box and the binder on the wheels which require attention, then remove the short 24 in. section of rail and move the locomotive until the blocked wheel is over the open space. It is then possible to easily remove the tire. The great flexibility of Mallet locomotives makes it difficult to jack them up for the purpose of making these repairs, and this scheme seems to answer the purpose very well. We are indebted to E. A. Murray, master mechanic at Clifton Forge, Va., for this information.



Arrangement of Double Drop Pits and Short Removable Rail Sections in the Chesapeake & Ohio Engine House at Clifton Forge, Va.

Electrification of French Railways.—For some time past the French State Railway authorities have been conducting electrification experiments on a stretch of the Western Railway, and it is reported that results have been so satisfactory that it has been decided to go into the matter on a larger scale. Contracts for 100 electric locomotives have just been placed with French and Belgian builders.

NEW APPRENTICESHIP PLANS ON ILLINOIS CENTRAL

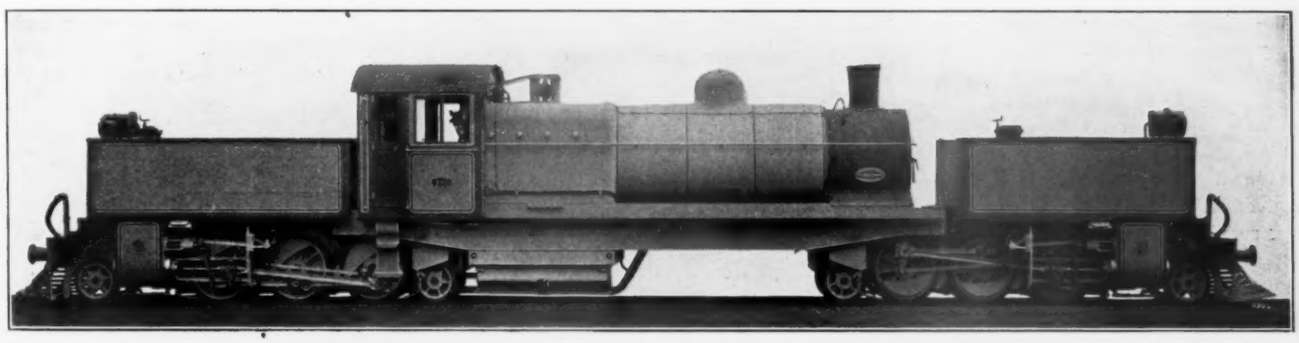
The educational department of the Illinois Central has entered into agreements with the local school authorities at McComb, Miss., Waterloo, Iowa, and Centralia, Ill., whereby the high school students may receive practical instruction in the trades in the Illinois Central shops. In this way a young man is able to continue his school work and at the same time earn a little money and learn a trade. He will receive the same instruction as a regular apprentice and will be required to sign the regular form of indenture. The young men deciding to avail themselves of this opportunity are divided into groups of two; one will work the full day in the shop, while the other attends school. They will alternate each day, the one entering the shop taking up the work where the other left off the night before. One-half hour's instruction is given the young men every day they are in the shop. This instruction is on practical shop arithmetic and drawings, being the same as given to the regular apprentice.

The young men will receive the same salary as the other apprentices, but as they are in the shop only one-half the time, they, of course, will only receive one-half the weekly wage of the regular apprentice. During the summer they are expected to spend their whole time in the shop, and at the end of four years of their high school training they will have spent two years and five months in the shop, but because of their training the Illinois Central will allow them three years' time, which means that the school apprentice will have to spend only one year more in the shop before he is made a regular journeyman. When the young man graduates from high school he has a job ready for him paying 18 cents an hour for the first six months

and 20 cents an hour for the second six months, which is better than most of the college apprentices receive when starting in their special apprenticeship course. The standards for the boys are exacting and failure to make the required showing in either the shop or the school will be sufficient cause for dismissal. The system has proved quite popular, and there are more than 18 students availing themselves of this opportunity at McComb. As soon as arrangements can be made, the system will also be installed at Vicksburg, Miss., and Paducah, Ky.

LARGEST NARROW GAGE LOCOMOTIVES

Two locomotives have recently been completed by Beyer, Peacock & Co., Manchester, England, for the Tasmanian government railways, which are the heaviest and most powerful ever built for a 3 ft. 6 in. gage road. They are of the Garratt type; one is for passenger service and the other for freight. This type of locomotive comprises a boiler carried on a girder frame connecting two carrier trucks, each of which practically consists of a complete locomotive without a boiler. The girder frame has a swivel connection near the inside end of both trucks and the trucks also carry large water tanks, the one at the rear of the boiler having a coal space. This arrangement avoids all restrictions on the size and shape of the boiler except the road clearance limit and a wide, deep type of firebox can be easily provided. At the same time a very powerful locomotive can be constructed that can safely traverse sharp curves and have a very small average weight per axle.



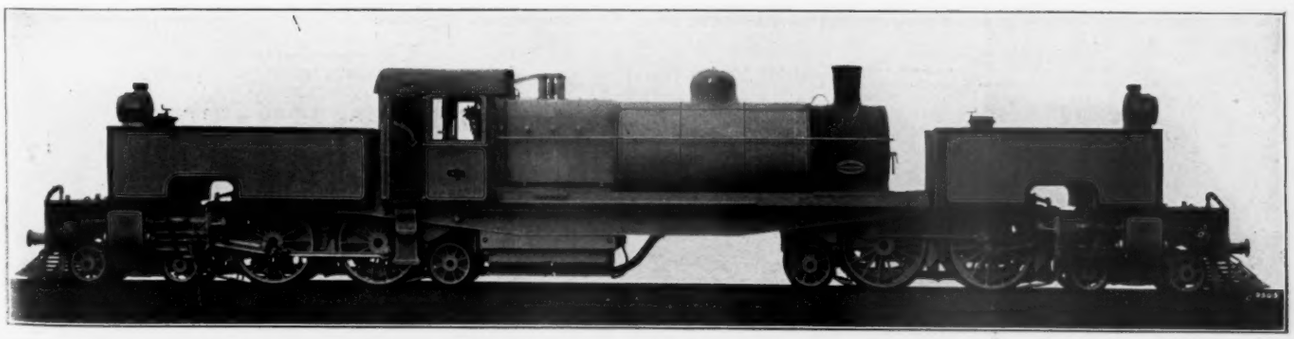
Powerful Freight Locomotive of the Garrett Type for a 3 ft. 6 in. Gage Line.

These locomotives were built after three years' experience with a locomotive of the same type built for a 2 ft. gage section of the Tasmanian lines. The passenger locomotive is designed for speeds of 50 miles an hour on straight track and 30 miles an hour on curves of 330 ft. radius. It is of the 4-4-2-2-4-4 type or, in other words, comprises two separate sets of running gear of the Atlantic type, set back to back and connected by the boiler frame. The two trucks are identical so far as running gear is concerned and each has four simple cylinders 12 in. in diameter with 20 in. stroke and drivers 60 in. in diameter. The tank on the front group has a capacity of 1900 gals. of water and that on the rear engine carries 1100 gals. of water and 4 tons of coal. The locomotive complete with full tanks of water has a total weight of 211,792 lbs. It weighs 162,036 lbs. without fuel or water in the tanks. The maximum weight per driving axle is 26,680 lbs. The cylinders are provided with piston valves operated by Walschaert valve gear, which is on the outside of the locomotive in the customary location and operates the inside valves by a rocker pivoted to the frames in front of the cylinders and connecting to the front extension of the valve stems of the two valves on each side of the locomotive. This arrangement is permitted as the inside and outside cranks are at 180 deg., giving the two valves opposite motion. A screw reverse gear in the cab controls the valve gear on both trucks simultaneously. The steam pipes have a ball joint in the exact centre of the pivoted connection to the boiler frame and thus do not require a slip joint.

A Schmidt superheater has been applied having 24 elements and giving a heating surface of 333 sq. ft. The boiler has a diameter of 5 ft. 3⅜ in. at the front end and contains 225 1¾ in. tubes and 24 5¼ in. flues, which are 11 ft. 3⅜ in. in length. The firebox has a grate area of 39.3 sq. ft. and a heating surface of 155.5 sq. ft. This gives a total evaporative heating surface of 1686 sq. ft. The boiler pressure is 160 lbs. per sq. in. The firebox is of copper.

Other dimensions of these locomotives are:

Diameter of truck wheels	28½ in.
Diameter of trailer wheels	32½ in.
Driving wheel base	6 ft.
Total wheel base of locomotive	61 ft. 10 in.
Distance between pivot points on trucks	30 ft. 6 in.



Garrett Type Passenger Locomotive for the Tasmanian Railway.

The water tanks have equilibrium connections and the locomotive is fitted with a speed indicator and two electric headlights.

The freight locomotive is of the 2-6-2-2-6-2 type. The boiler is identical with that on the passenger locomotive and the total weight of the engine loaded is 201,724 lbs. With empty tanks the weight is 152,120 lbs. The engines on each group are two

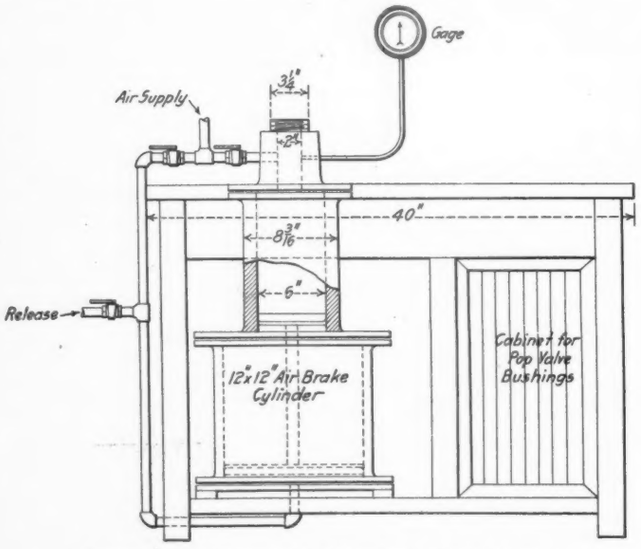
cylinder simple, the cylinders being 15 in. x 22 in. The drivers are 42 in. in diameter and the rigid wheel base is 8 ft. The total wheel base of the locomotive is 60 ft. 8 in. and the distance between swivel points is 29 ft. 8 in. The front water tank capacity is 1900 gals., and the back water tank 1100 gals., and 4 tons of coal. These locomotives are designed for a speed of 20 miles an hour on reverse curves of 330 ft. radius. The construction of details is similar to the passenger locomotive wherever possible. The freight engine has two acetylene headlights instead of electric as on the passenger locomotive.

According to *Engineering*, from which this information is taken, the engines are fully able to satisfy all conditions specified and gave great steadiness and flexibility on the trial track laid down at the builders' works to represent the worst conditions that would be met in service.

ADJUSTING SAFETY VALVES*

BY C. L. DICKERT,
Assistant Master Mechanic, Central of Georgia, Macon, Ga.

For the past eight years the testing and adjusting of safety valves at the Macon shops of the Central of Georgia has been most successfully performed on the device shown in the accompanying illustration. This consists of two old air brake cylinders; one 12 in., and the other 6 in. in diameter, the smaller being secured on top of the larger, and each fitted with a piston having a common piston rod. On the top of the smaller cylinder is a cap threaded for a 3¼ in. safety valve. Bushings are made to fit this cap and allow the application of other sizes of valves. A standard gage and also a connection to the shop air supply line is connected to the 2 in. passage in the cap. An



Device for Testing and Adjusting Safety Valves.

air line is also carried to the bottom of the larger cylinder. The arrangement of the piping and the location of the valves for admission and release are shown in the illustration. All of this apparatus is fitted in a special bench which has a cabinet for storing the fittings and parts.

After the safety valve to be tseted and adjusted is secured in place, a valve is opened which admits air above the piston of the upper cylinder. When the full pressure of the shop supply line, usually 100 lbs., is attained, the valve controlling this connection is closed and air is admitted to the bottom of the large cylinder. Manipulation of the valve on the pipe furnishing air to this cylinder gives any desired pressure in the upper cylinder and on the safety valve, from 100 lbs. to 225 lbs. When the safety valve opens, the pressure in the top of the upper cylinder is released and the supply to the large cylinder is then cut off and the release valve is opened. Pressure is then again admitted to the top of the upper cylinder, forcing the pistons to the bottom of their stroke and putting the machine in readiness for the next test.

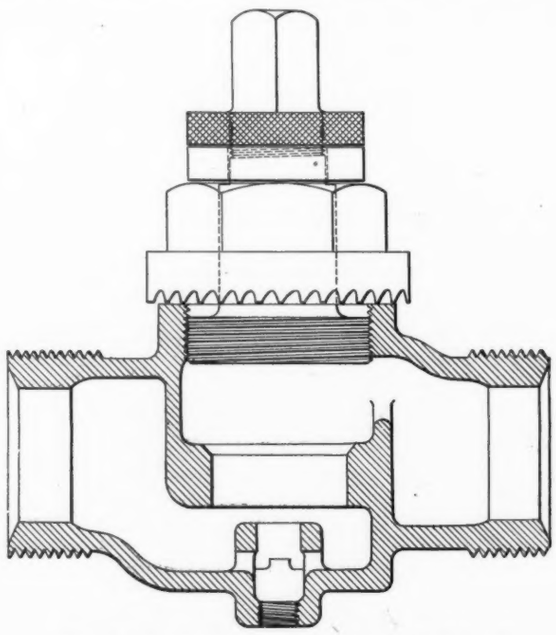
With this device it has been found that it is not necessary to adjust the safety valves after they have been applied to a locomotive and a supply of repaired valves properly set can be maintained in stock ready for application to any locomotive that goes through the shop or for shipping to an outside roundhouse. There is of course a slight difference in the point of release of a valve when used in connection with air and steam pressure, but it is the practice in this shop for one man to do all of this work and it takes but a short time for him to become familiar with the corrective factor that should be used so that the valves will release properly under steam pressure. As a further check, however, this specialist is present when the engine is fired up as it leaves the shop and assures himself that the values are correct by actually forcing them to release under steam pressure when they are in place on the boiler. At present from 90 to 100 valves per month are being adjusted on this device. When the valves are shipped to outlying points a local inspector or foreman is required to test them under actual conditions after they have been applied to the locomotive.

*Mr. Dickert informs us that the idea of this machine was obtained a number of years ago from some mechanical journal. As the name of the paper has been forgotten, proper credit cannot be given, but in view of the value of the device, which is evidently not generally known, it seems advisable to again give it publicity.—Editor.

REPAIRING BOILER CHECK VALVE

BY CHARLES MARKEL.

A useful tool for reseating the boiler check cap joint is shown in the accompanying illustration. All that is required is to remove the check cap and insert the pilot plug in the threaded portion of the valve. The cutter is placed over this pilot and is turned by a wrench which grips the hexagonal head. The tool



Reamer for Facing the Boiler Check Cap Joint.

is fed down by a knurled collar which is threaded to the pilot and is turned by hand. A first-class joint can be made and much labor is saved, as the check valve does not have to be removed from the boiler.

THE MANUFACTURE OF BRAKE BEAM HANGERS

Methods Used at the Cleveland Shops of the Erie, by Which They Are Made at a Labor Cost of Five Cents Each.

BY R. S. MOUNCE.

On a railway which requires upwards of 35,000 brake beam hangers each year, it is of great importance that the manufacturing cost be lowered to a minimum. The Cleveland shop furnishes about one-third of the total requirements of brake beam hangers and these are made up in one or two lots per year. Special tools have been designed and methods best suited to a rapid output have been developed with such satisfactory results that the hangers are now manufactured at a total labor cost of 5 cents each. This price includes everything except cutting the stock to the proper length, and carting the finished hangers to

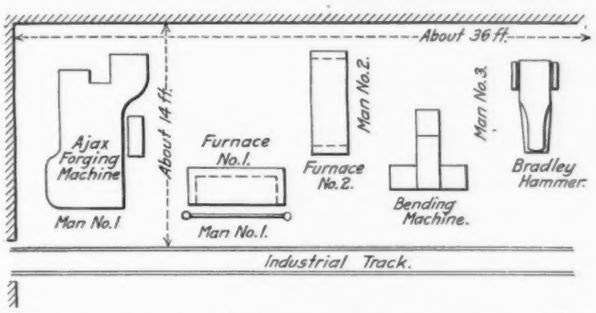


Fig. 1—Arrangement of Machines and Furnaces for Manufacturing Brake Beam Hangers.

the storehouse. Until recently the pin holes were drilled, but now they are punched, which, taking into consideration the difference in labor of drilling and of punching, as well as the fact that the hangers do not have to be carted from the blacksmith shop to the machine shop, made a saving of about 0.66 cents per hanger. The following description applies directly to the several drawings which show in considerable detail the methods employed and the tools used in the process of manufacture.

METHOD OF MANUFACTURE.

Reference to the arrangement of machines and furnaces, as shown in Fig. 1, indicates that the floor space required for manufacturing brake hangers is very small, being about 36 ft. x 14 ft. The stock is cut to the proper length and piled close to furnace No. 1. Man No. 1 takes care of this furnace and operates the Ajax forging machine, where the ends of the hangers are forged and the holes punched. Referring to Fig. 2, it is seen that this part of the work requires three operations per end, with one heat for each operation. Attempts have been made to perform operation 2 immediately after 1, but they were unsuccessful, as it was found that sufficient heat was not retained to permit of a good smooth end being formed after the second operation. Two men have been used on this part of the work, but it was found that one man could do almost as much work as two, and, of course, at a considerably lower cost. Man No. 1 works continuously, but the other two men do not commence until there

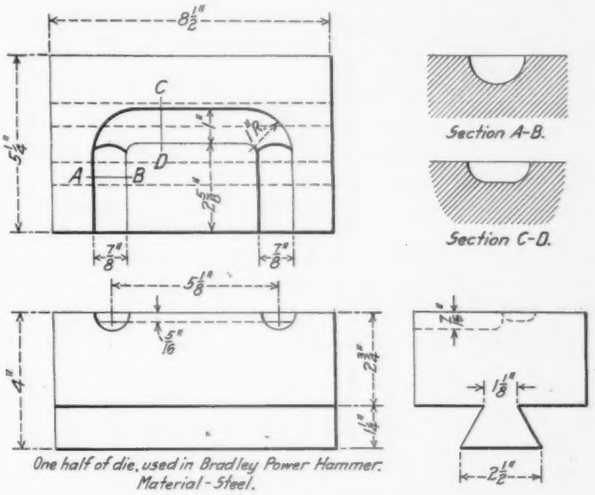


Fig. 3—Flattening Die for Brake Hangers.

are two hundred or more hangers ready to be bent and flattened. They work until they have caught up with man No. 1, and are then taken off the brake hanger job until there is another pile of partly finished hangers ready for them.

Man No. 2 tends furnace No. 2, which, it will be noted, is open on both sides to permit of obtaining a long heat in the middle of the bar, which is necessary for the bending operation. The bars are centered with a deep center punch mark, in order to facilitate placing them on the bending machine so that the legs will be of the same length after bending, and so that the holes will come in line. They are then placed in the furnace.

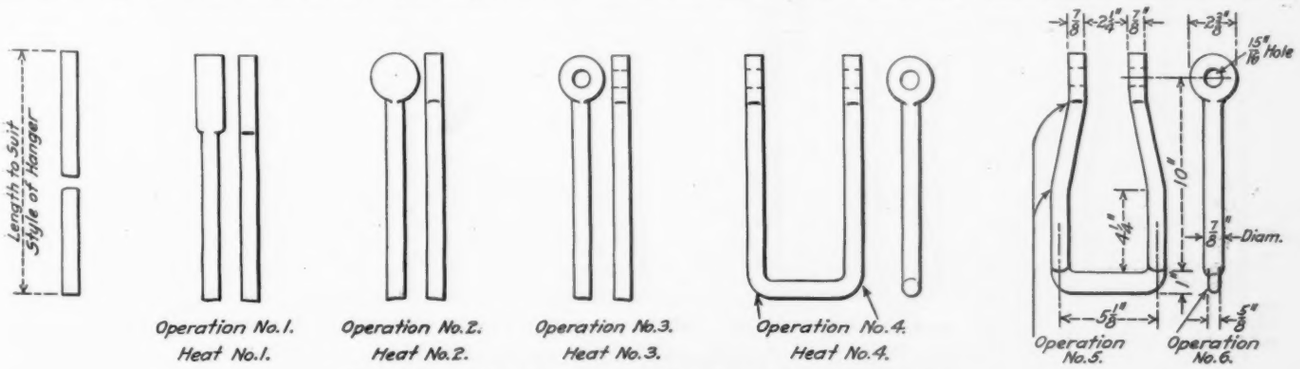


Fig. 2—Successive Operations of Manufacturing Brake Hangers.

Fig. 2 shows that the three operations—bending, offsetting and flattening—require one heat. Man No. 2 takes the hanger from the furnace and places it against the stationary former *E*, Fig. 5, of the bending machine. Man No. 3 is stationed on the oppo-

site side of this machine in a position to operate the several air valves. Air is then applied to the head cylinder, which moves the bending former *C* against the brake hanger, giving it the form shown by Fig. 2, operation No. 4. The hanger is then placed against the lower section of the stationary former *D*. The bending former is moved against it, to hold it rigidly in place, and then air is applied to the two cylinders which move the toggles *A* and the toggle formers *B* against the legs of the hanger, giving them the proper offset. This completes operation No. 5. Another heat is unnecessary for operation No. 6, which simply consists in flattening the bottom of the hanger as shown by the last sketch on Fig. 2. This is done by man No. 3, who removes the hanger from the bending machine and immediately places it over the lower half of the die shown in Fig. 3, which is fitted to the anvil of a Bradley power hammer. A few light blows of the hammer, which carries the other half of the die,

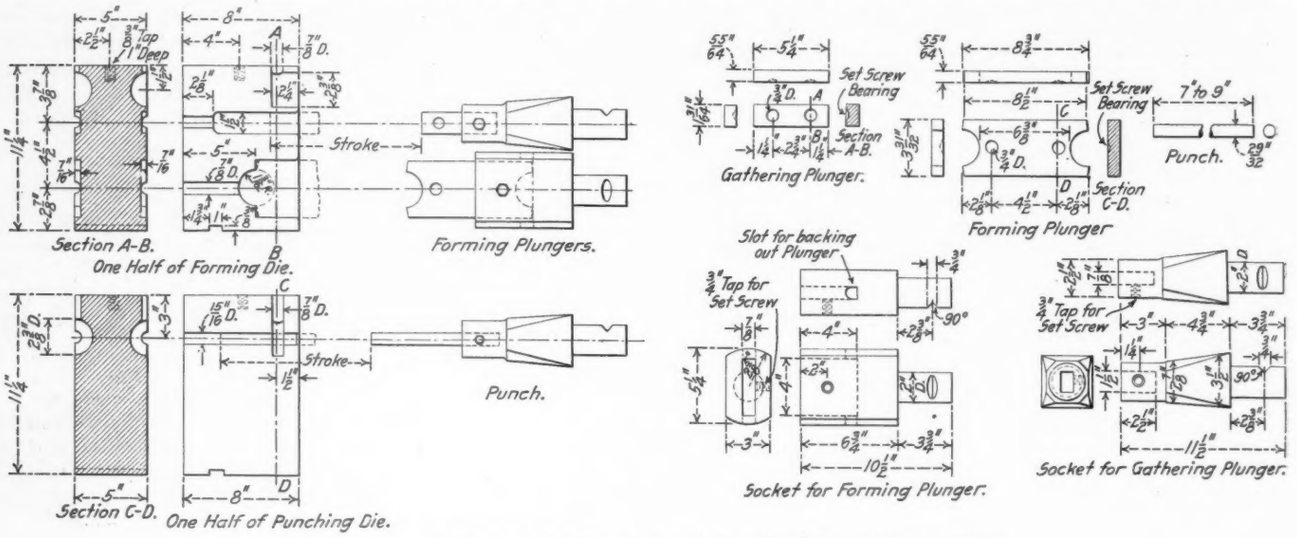


Fig. 4—Dies and Plungers for Forming and Punching Brake Hanger Ends.

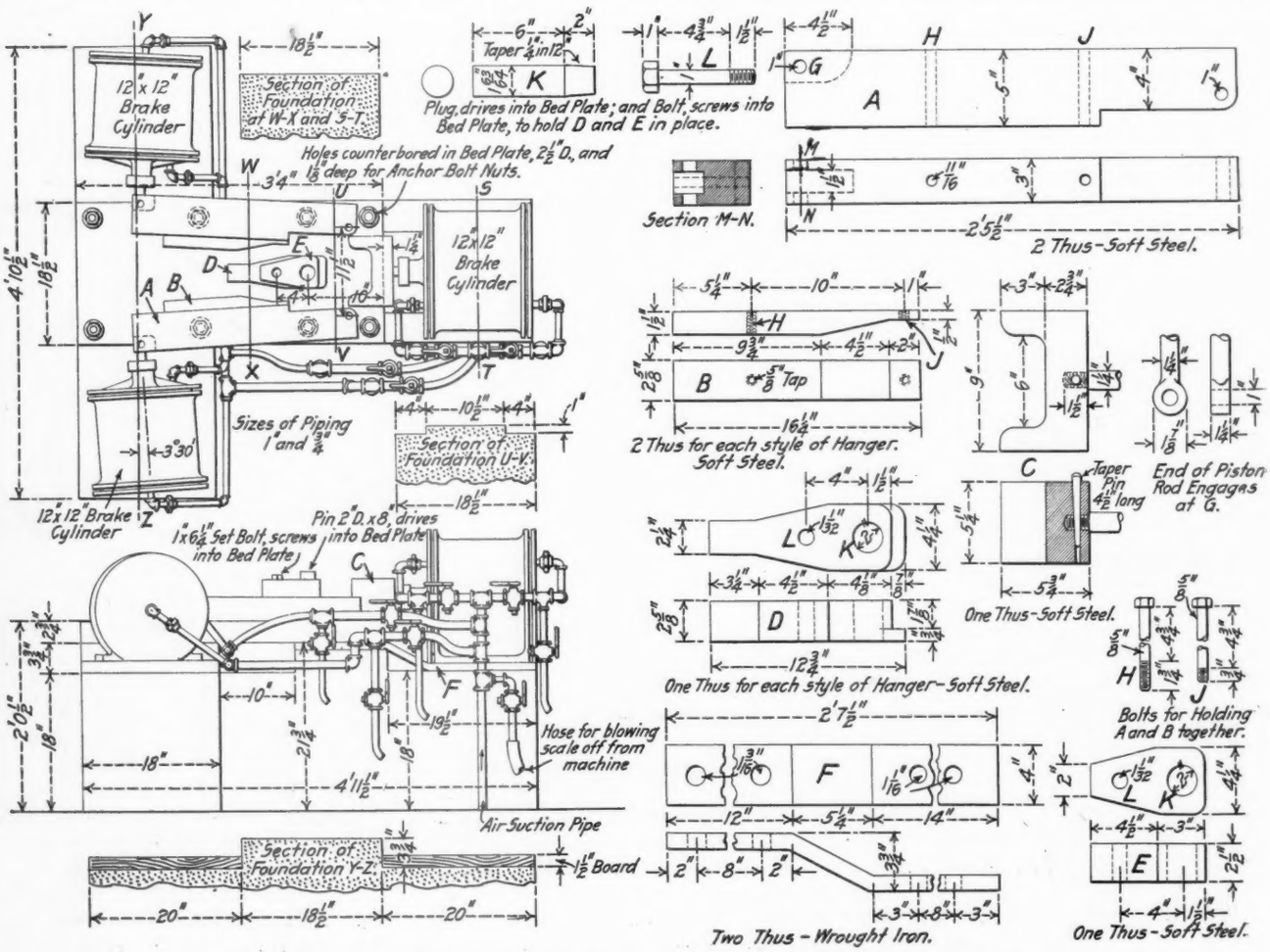

12"x12" Brake Cylinder
Section of Foundation W-X and S-T.
Plug, drives into Bed Plate; and Bolt, screws into Bed Plate, to hold D and E in place.
Holes counterbored in Bed Plate, 2½" D., and 1⅛ deep for Anchor Bolt Nuts.
Section M-N.
2 Thus-Soft Steel.
Sizes of Piping 1" and ¾"
Section of Foundation U-V.
2 Thus for each style of Hanger. Soft Steel.
End of Piston Rod Engages at G.
12"x12" Brake Cylinder
1"x6¼" Set Bolt, screws into Bed Plate
Pin 2"D. x 8", drives into Bed Plate
One Thus-Soft Steel.
One Thus for each style of Hanger-Soft Steel.
Bolts for Holding A and B together.
Hose for blowing scale off from machine
Air Suction Pipe
Section of Foundation Y-Z.
½" Board
Two Thus-Wrought Iron.
One Thus-Soft Steel.

Fig. 5—General Arrangement and Details of Bending Machine for Brake Hangers.

completes the operation and the brake hanger is finished and ready for use.

DETAILS OF TOOLS.

The forming dies and plungers shown in Fig. 4 perform the first two operations on the Ajax forging machine, namely, gathering the stock at the end of the bar, and forming it into its final shape. The opening shown at the upper part of the die is used to trim off burrs that may have been formed on the hanger ends during the process of forming. It will be noted that both the die and the plungers are made reversible, thereby producing two complete sets of dies and plungers with a minimum number of parts. These tools are used for every style of brake hanger, because the ends of all styles have the same dimensions. The punching die and plunger are fully explained by the drawing. They also are reversible. If holes larger or smaller than 15/16 in. are required it is necessary to have a die and plunger for each size.

The bending machine is illustrated in Fig. 5, and was made in the shop. It consists essentially of a cast iron slab bed-plate, three air brake cylinders, and all necessary details, the whole resting on a tee shaped concrete foundation. The head cylinder is rigidly fastened to the bed-plate by means of two pieces of 1 in. x 4 in. bar iron fitted up as shown at *F*. This rigidity was deemed necessary because a much greater force is required to bend a brake hanger than to offset its legs. The two 12 in. cylinders operate the toggles *A*. The toggles swing about the head pins, which screw into the bed-plate. The bending former *C* is used for all styles of hangers. The stationary former *D* and *E* is held rigidly in place by a pin which is driven into the bed-plate, and by a bolt which is screwed into the bed-plate. The upper section *E* is used for making the bend and applies to all styles of hangers. The lower section *D* is used to form the offset in the brake hanger legs, in connection with the toggle formers *B*. Each style of hanger requires a stationary former *D* and a pair of toggle formers.

The arrangement of air piping is clearly shown in Fig. 5. The major part of the system is made up of 1 in., and the rest of ¾ in. pipe. The two 12 in. cylinders are connected in parallel so that both may be operated by the same valve. The piping is arranged so that air may be admitted to either end of each cylinder, in order to give a quick return stroke immediately after a working stroke. A hose connection for blowing any accumulation of scale from the machine is also provided.

The flattening die used in connection with the Bradley power hammer has already been mentioned and is shown in Fig. 3.

The two furnaces are of the ordinary oil burning type. The one near the Ajax forging machine is open at one side only, and is suitable for end heats. The other is of the same general construction, and, as has been previously mentioned, is open clear through from side to side, so that long central heats may be obtained.

CONCLUSIONS.

The foregoing description shows that the low cost of manufacturing brake beam hangers has been made possible only by a very careful study of every phase of the subject. The tools have been so designed and all the machines so arranged that the number of operations is minimized. When the first part of the work has been completed, the hangers are so placed that the remainder of the work can be commenced without the loss of a single motion. The hourly wages of the three men aggregate 56 cents, and their piece work earnings, at 5 cents per hanger, amount to from 55 to 70 cents per hour.

SHOP KINKS

BY C. H. VOGES,

General Foreman, Cleveland, Cincinnati, Chicago & St. Louis, Bellefontaine, Ohio.

VALVE SETTING MACHINE.

A machine for turning the drivers of a locomotive while the valves are being set is shown in Fig. 1. It consists of four rollers on which the main drivers rest. The rollers are operated through a set of swiveled joints by an air motor with the ar-

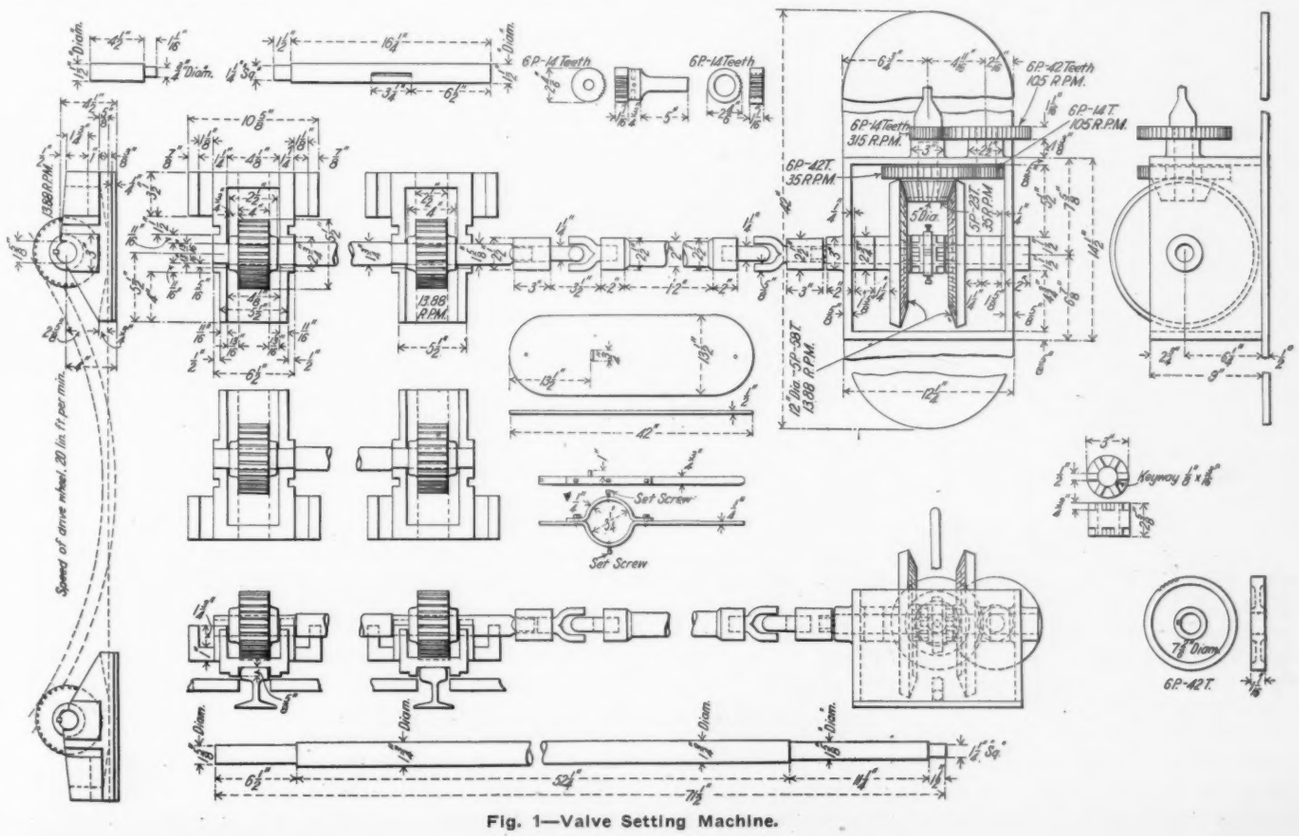


Fig. 1—Valve Setting Machine.

rangement of gearing shown in the illustration. This gearing is driven by a reversible motor which greatly facilitates the work of the setting valves. The details shown clearly illustrate the size of the various gears, and the revolutions at which they are supposed to be operated.

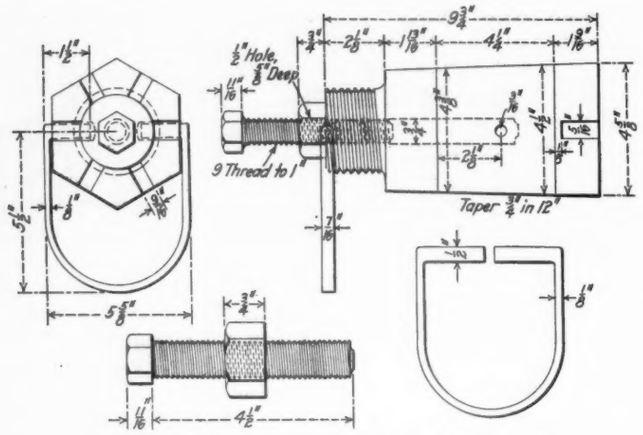


Fig. 2—Lock for a Crosshead Pin Grease Plug.

LOCK FOR A GREASE PLUG.

An effective method of locking a grease plug in a crosshead pin is shown in Fig. 2. It consists of two ½ in. pins which extend through grooves on the inside face of the nut and in the crosshead pin as shown in the illustration. These pins are held in position by a piece of ⅛ in. spring steel with sufficient tension to keep them from falling out. The device has proved a success in service and is easily made.

RADIUS ATTACHMENT FOR SLOTTING QUADRANTS OR LINKS.

The radius attachment shown in Fig. 3 is used for slotting reverse lever quadrants or links. The work is held at the end of the two radius arms by set screw clamps, which are pivoted on the ends of the arms. The other ends of the radius arms are held on a pivot bolt which is firmly attached to the 3 in. x ⅞ in. bar extending out from the table of the machine. The work is clamped to the table by a ¾ in. set screw, operating in an offset clamp that is bolted to the table. The work is adjusted by a lead screw 33 in. long, which operates through a swivel nut located at the end of a 2¾ in. x ¾ in. bar, which is clamped to the table. The end of the lead screw has a flat head, which is free to turn in the connection that fastens it to the work. Several sets of holes are located in the radius bars and pivot holder, to provide for the different radii.

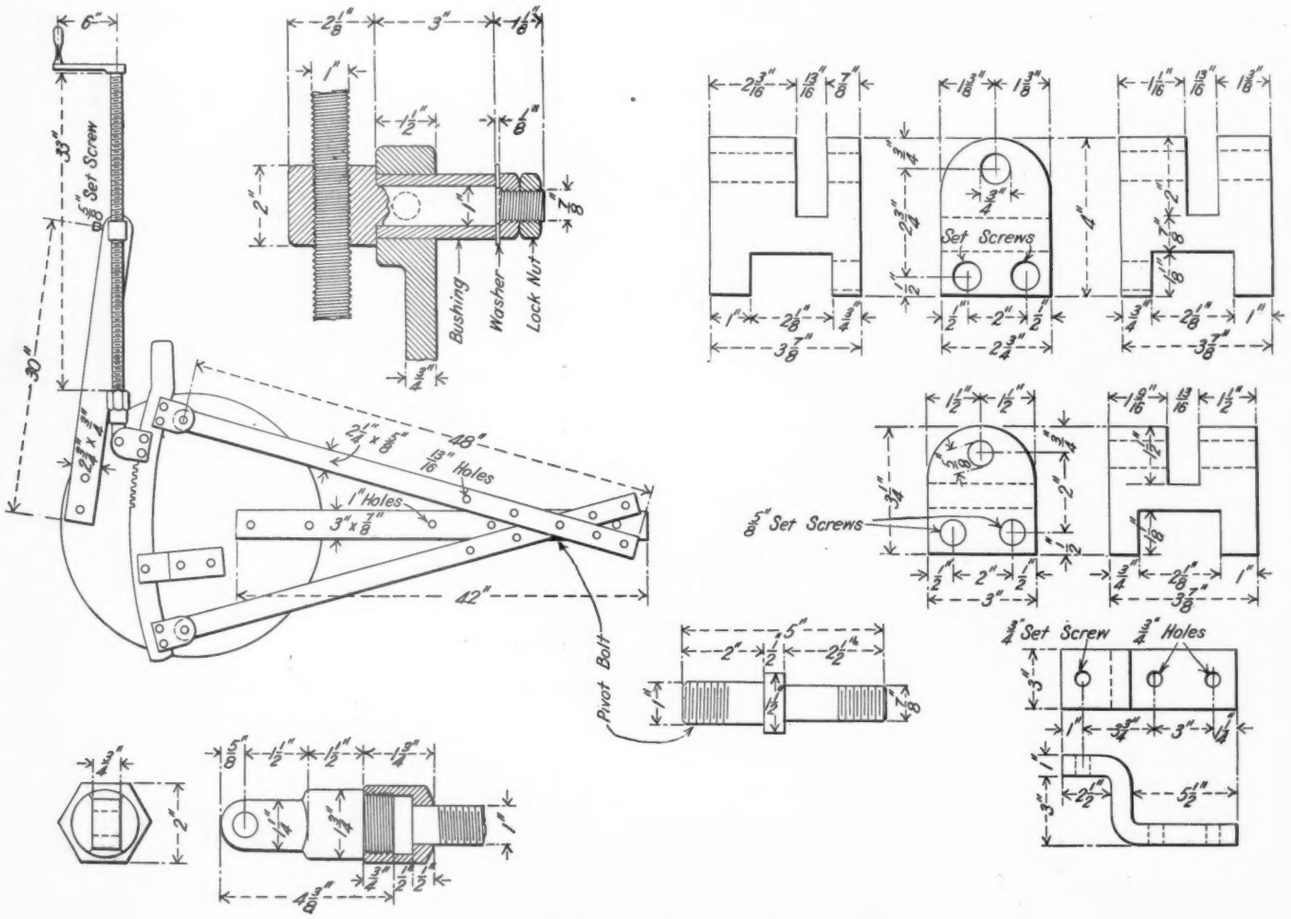


Fig. 3—Radius Attachment for Slotting Machine.

ITALIAN RAILWAY ELECTRIFICATION.—The administration of the Italian state railways is now considering a scheme for the electrification of a great part of the lines, and for a start it is proposed to electrify the 12-mile line from Rome to Ancone. Water power from the falls of Terni and Fabriano will be utilized for the generation of the electricity, and it is stated that if the results of the working of this section prove satisfactory the administration intends to arrange for the gradual electrification of the whole railway system.

FRANKED MAIL.—During the last fiscal year 310,245,000 pieces of franked mail were carried. The weight was 3.8 per cent. of the total weight of all domestic mail carried.

MANAGEMENT OF A DRAWING ROOM

Co-operation, Fair Dealing and Suitable Environment Are as Important Here as in the Shop.

BY FOLBERT A. SCHMIDT.

Public attention has recently been drawn very pointedly to the subject of scientific management, and since prominent business establishments have frequently been cited as illustrations of its success, favorable as well as unfavorable interests have given it serious consideration. While for some time active and successful work has been devoted to effecting a high efficiency in machines, the value of good management in the development of men and the greater importance in business life of efficiency in men as against efficiency in machines is but beginning to be realized.

For a drawing room, where efforts are chiefly devoted to originating and where a creative spirit prevails, scientific management may seem to be an audacious suggestion. It is impossible to direct and plan for the progress of original work and the new science of time study is of no avail to a production which depends on the designer's mind and his initiative. But while it might be understood that production of an original nature is not to be dominated by method or system, and that no definite time can be set for its completion, the importance and the necessity may be realized for applying the scientific habit of thought to the fruitful development of men and to conditions which favor their favorable inspiration.

For all work there must be determined the theoretical point of its highest efficiency, both by science and experiments, by studying closely the most suitable conditions under which the work is to be performed, by determining what manipulations are necessary and how to carry them out with the greatest economy and by supplying the best of tools and prescribing how to use them.

Advantageous conditions under which efficient work is performed in a drawing room are exhaustive ventilation, proper temperature, good light, a thorough cleanliness and ample and sanitary provisions for the other necessities of the body.

Proper ventilation and temperature must be ascertained scientifically and adhered to conscientiously by the management. By no means should their regulation be made by the draftsmen, as it would then be performed according to momentary necessities and personal feelings and would not be efficient. We are more or less apt to take colds—some are very sensitive to unsuitable temperatures and since it is a fact that the efficiency of a man's energy drops one-half or more when his well being is only slightly interfered with, it is evidently in the interest of a good management to prevent all neglectfulness in the caretaking of men.

A thorough cleanliness is extremely advisable in a department where a number of men are confined to a comparatively small space from eight to nine hours a day. Besides the bad effect on men's energy, which I have mentioned with regard to insufficient ventilation, uncleanly surroundings are accompanied by drawings which are unclean and lack high efficiency in consequence, not to speak of the lost time and effort devoted to the attempt to keep the sheets clean.

One other important feature that may greatly increase the capacity of a drawing room is good light. Its advantage is much greater than is generaly assumed, and the comparatively small means required to reach efficiency in this respect make it all the more remarkable that so few steps are taken to provide it. The expense of a rearrangement to obtain ample light for all is little in comparison to the time saved and the comfort rendered. This is especially true with regard to the tracers.

To find the most efficient way of performing work, it is analyzed as to its elementary manipulations; the absolute necessity and the purpose of each is decided by experimental truth and science, and a system is applied according to which fixed functions take place in the proper sequence. In making drawings under present conditions, each draftsman has adopted a system to which he has trained himself as best he could and according to which he does his work. As a rule these systems are very much alike. Each draftsman has his own individual way of doing many things and, according to ability, his work distinguishes itself by economy and practicability. At times it can be observed that a man has found his way to a system of a remarkable efficiency. If a man has steadfast qualities that develop strong habits, he does his work persistently according to a fixed system, thus producing efficiency to a certain degree, whereas a less thorough and steady man works in many different ways, always according to his notions and momentary conclusions. A man with many years' experience is not necessarily an efficient man, only he who seeks "truth for authority and not authority for truth," is the best man in the end. These facts lead to the conclusion that, however much freedom there must be granted to the draftsman, as mentioned above, the mechanical functions of producing the drawings should be clutched by a method that has been established by experimental truth and science and to which all must become subjects. The advantages are avoidances of errors, saving of time and the occasion for a stringent co-operation.

Hand in hand with the study of the elementary functions of the work goes the task of investigating what are the most suitable tools with which these functions are to be performed. Tools must always be in first class condition; if not, much time is lost and speedy and precise work is hindered. Hence an inspection of the tools should be undertaken from time to time; the men must be advised to report even slight faults and for each tool in use an emergency outfit should be kept in stock to prevent delay. At present negligence in this respect can often be observed which approaches narrow-minded avarice. Narrow minded, because economy thus practiced has always the reverse effect by causing expenses quite unproportionate to the cost of even luxurious instruments. These expenses are not only due to inefficient working, but largely also to the disgust of the men who realize that the results from their honest striving and ability are counteracted by the unsufficient conditions under which they are asked to work and for which the management has the responsibility. We realize that the square deal to the men alone would command the supply of first-class instruments, besides the economical interest of an intelligent management that requires it. For tools which are not furnished by the company, standards should be issued, as for equal results, equal values are needed.

Good tools are a good investment, especially when exhaustive instructions are given how to care for them and how to use them. At present the rule stands good, that different men may very well use different tools for the same purpose in order to reach the best results. This rule is wrong according to the principles of efficient management in a drawing room, because it involves avoidable difficulty in reading the drawings and is the occasion of errors and waste of time. In order to effect a uniform appearance of the drawings, the different characteristic lines, figures, etc., are determined and for the accomplishment

of each, the appropriate grade of pencil is issued by stating its number. For tracing, the thickness of the different lines are settled definitely and each tracer may be furnished with a sample and an instruction sheet which will ensure uniform production. Repairing tools and using them are separate features, wherefore the sharpening of drawing pens and the like should be performed by an especially assigned man who is trained and skilled and produces the best and quickest work. Experience teaches that a laborer with even the least intelligence is capable of becoming expert in a small limited occupation, if it suits his inclination, and if he gets the amount of practice which trains him to do his work perfectly.

In a drawing room more than anywhere else, efficient management depends on the competence and the personality of the manager. Since ways and means for the accomplishment of work are therefore almost entirely devised and decided by individual strength and individual judgment, the methods vary in different concerns, however much alike their purpose. Authorities in the management of drawing offices maintain that the working capacity of the newly engaged body of experienced men becomes normal only after six months of studious adaptation to the new conditions. This makes comprehensive and systematic training of the men a necessity, especially so when a science of the work has been developed. Besides, a good management owes it to itself, as much as to the men, to assist in every way possible the latter's acquirement of experiences, which are to be used to the advantage of the concern.

The present conditions are utterly inefficient in this respect. For instance, a tracer is at a loss to understand a certain part of the drawing he is to copy. At first he tries to discover the meaning of the perplexing part himself, thus losing time. It may be that sooner or later he comes to think that he has found it and goes ahead with his work; but whether he really has the right conception is another question and the cost of his error multiplies itself, since one mistake causes others and higher paid men are concerning themselves with it afterwards. Furthermore when somebody else corrects it and no information regarding it reaches him, there is nothing to prevent the tracer from making the same error again. On the other hand it may be that he cannot decide as to the proper meaning of the concerned part and that he has to leave his desk to hunt the designer. Considerable time may easily elapse before the tracer gets the advice desired, because the designer may have been called away under similar circumstances or is engaged in a task which does not permit ready accommodation. When finally the information is given, it takes place in an unconcerned and imperfect manner.

All tracers ought to be assembled in a tracing department, furnished with suitable special contrivances and located in the part of the building which offers the best light. A foreman should be installed in charge of it, who is to instruct the tracers as to the science of their work and explain complications in the drawings that cannot be understood. We bear in mind that the drawings are now finished according to one uniform method, which enables every competent man to read their meaning. This fact itself facilitates tracing greatly, cancels many avoidable questions and makes possible a third person's true conception of its meaning and full ability to give advice regarding it.

A designer is to create, not to instruct! These are features far apart and must be considered so. Just in this lies the great advantage of system, that the combination is divided into its natural parts, each of which is taken care of separately in order to warrant an ideal co-operation.

In selecting the men for their proper places in a drawing room, two principal items are distinguished, designing and managing. A good constructor is very seldom at the same time a good manager, owing to the fact that the personal qualities required for each are quite different and their combination is probably impossible. A practical, active man with capacity to arrange and a strong sense for system should therefore be taken away from the board and make room for a fellow who thinks constructively and combines logical reasoning with the kind of a memory from which the wanted advice can be drawn and applied in a restful and concentrated manner.

Selecting a man to the occupation of checking is difficult and seldom is given the proper attention. The efficient performance of this work requires qualities to a high degree, which enable objective and impersonal dealing with the other man's production, and the denial of his own opinions in the interest of the company. In other words, it demands a judicial mind. Many a piece of work is changed by the checker, when in its original shape it would have served its purpose, sometimes on account of his inability to forego his own ideas, and often also because of a personal misunderstanding. It involves waste of effort and unnecessary discouragement of the men. Besides, by selecting trustworthy men, who would treat the work with due respect and the honest will to comprehend the originator, considerable addition is made to peaceful co-operation.

Owing to the original work and the uncertain course it may take, the development of a definite system, which will ensure perfect co-operation for all occasions, is probably the most difficult problem to be undertaken in a drawing-room. Yet co-operation, the goal of all efficient management, is aimed for successfully in many different ways.

A man's engagement with a business concern is a serious matter and the responsibility in which both are involved must not be underestimated, if results are to give satisfaction to both and an understanding be effected that brings about confidence and a truly social condition.

An employee devotes to his company daily from eight to nine hours of his active life, for which he receives a fixed price, and for which theoretically he should try his best and use every possible effort in the interest of his employer. Does the management, however, treat and regard its men in a manner which warrants their serious and complete devotion to their work? In many cases this question cannot be answered in the affirmative, which means that harmonious co-operation, based on the perfect understanding between the management and the men, is retarded. But efficiency lies in the good will and the diligent attitude with the men and is brought about only by conscientiously shouldering the duties which arise in the management of men. By positive subjection to the realized responsibilities on the part of the management, the men are led to acknowledge and bear cheerfully their own responsibility, and not to waste the time which does not belong to them, but which they are more or less at liberty to use according to individual estimation. Good management has the duty to comfort the men with the most suitable working conditions and to appreciate earnestly and actively the services rendered, so that working is in no wise disturbed or discouraged. By no means should the treatment of men be such that a degree of slavery is felt. The men must be met in a friendly way and with appreciation, so that rather a convinced feeling is produced that all are united in working for one purpose, which consummation is a pleasure and means actual profit.

An ideal co-operation requires proper division of the work and its accomplishment in suitable quarters. The knowledge of the men's personal inclination, which precedes their selection, and has been obtained by earnest observations of individual qualities, is needed to distribute the work suitably. The average man is naturally inclined to a particular line of work and dislikes to practice contrary to his categories. To influence a man's specializing in his favorite pursuit is therefore important for the fruitful development of his competence, as well as for the efficient and economical output of work. It appears that these simple rules, established time and again, are generally realized to be true enough, but that the allowed number of exceptions is exceeded, thus converting the exception to the rule.

In endeavoring to get the proper division of work, attention

should be given to have it done in harmony with the state of development of the men. This prevents designation of a problem to a man not yet capable of mastering it. On the other hand by gradually increasing the scope of the problems assigned, the men's gradual and fruitful development is ensured. It is customary to have the drawings of the youngest detailer traced by the youngest beginner. Quite to the contrary, the work of a detailer who is not yet familiar with the science of his occupation, should be designated to the most experienced copiest, so that conditions are somewhat equalized. In this respect also an increase of efficiency is made by co-operation.

In drawing-rooms in general it is observed, and I suppose assumed to be quite the proper thing by many, that the management pays its men as little as possible. The natural result is that the men are keeping their production down to the affordable minimum. It means a vast difference, whether a man really tries to do his best, or whether he does just enough to keep above the firing line. Good management, which attempts co-operation with its men, concerns itself earnestly with their qualities and encourages and rewards honest striving in due time. It is wrong to wait until the men have to come and beg for that which belongs to them. Raising the men's salaries is of grave importance, and doing it in the nick of time produces the confidence and gratitude on which co-operation is founded. If the character of the men has been given some observation, confidence may justly be shown according to individual qualities. At present the treatment of men has the strong tendency to presuppose a general mistrust by principle. If there is no obvious confidence set in the men, they have none to justify and are denied the spur to best efforts, perseverance and economy. The results of the checker's work are not very conspicuous when he is dealing with the production of a clever and conscientious man. In order to satisfy his manager, who wants to "see" work, the checker undertakes changes for which there is not the slightest cause and which often destroy harmonies, created at cost of deep thought and laborious concentration on part of the designer. Quite upset by the appearance of his corrected sheet, which he meant to have done well, the latter inquires why these unreasonable changes have been made and receives the unhesitating reply that it has merely been done as a matter of self defense. The eminent iniquity of such proceeding never fails in its sad reaction on general economy and the spirit of the work.

Co-operation is effected by doing a certain amount of routing of the men's work. Since one step depends on another to smaller or larger degree, it is necessary to undertake them in the proper sequence, so that the first is fully completed before the second, relying on the first, is begun. Thus all work is started on the sound basis of sufficient information, the inefficiency of going over the same ground again and again is dispensed with and the occasion is given for speed production and good spirit with the men. Furthermore, all instructions, instead of giving them in a personal, offhand manner, should be written on an instruction sheet.

Thoroughly systematizing the work and conscientious supervision of its smallest details affirms steady co-operation. Hence a classification of the rooms, the desks, tracings and so forth should be endeavored in order to furnish the means for transparent oversight and simplified management. Footing on this classification, by which objects are named by means of symbols in an unmistakable manner, a production bulletin board may be installed, to show the progress of each characteristic work on the different desks. It permits a designation and supply of work to its proper quarters ahead of time, to realize what amount of work has been accomplished, and it offers a fair chance to calculate the forces required to arrive at completion within a specified time.

High efficiency, the watch word of the day, is forced on railways as well as all other industries by the ever increasing competition and spells the difference between success and failure in many obvious cases. It is developed by scientifically selecting the ingredients for a stringent co-operation, and, before all, the upright and conscientious deal between man and man.

THE SAFETY HABIT*

BY J. D. KELLY,
La Junta, Colo.

Accidents which occur on railways, not only in the shops and roundhouses, but in the yard and on the road, must, in the main, be attributed, not to a lack of safety devices, nor to any indifference on the part of the railway to the welfare of its employees and patrons, but rather to individual carelessness. Safety appliances may and should be devised and applied wherever their use will render less hazardous the various occupations in connection with railroading. The men who direct

An Engine House Office Building Decorated with the Safety Sign.

the policies of the railways realize this to the fullest extent, and there can be but little complaint that the precautions necessary to protect the life and limb of employees and the public are neglected, or that the rules which they provide for the conduct of their business are in any way lax.

A full realization of the situation is shown by the action of the various great roads of the United States, who, during the past few years, have inaugurated campaigns of safety among their employees. Hardly a railway of importance could be mentioned which does not have its safety committees, composed of employees of all grades who investigate and report on all matters pertaining to the general safety; hardly a road but that has put in circulation literature designed to educate its employees in methods of safety.

Certain risks may be eliminated by the provision of safety devices, but by far the greater proportion cannot, and may only be guarded against by constant caution on the part of those

*Entered in the Safety Competition, which closed June 1, 1912.

whom they endanger. Those risks which come under the first or avoidable class are easily handled, it merely being a matter of devising and installing guards to eliminate them. The minimization of accidents due to the second class is the problem which requires the gravest consideration. Carelessness is an inborn characteristic of the average man and the substitution of caution is a matter of education. This fact is realized by at least one of the great railways and the methods which it is pursuing to accomplish this end are worthy of description.

The road in question is the Santa Fe, and the campaign of education is under the direction of a man eminently fitted for the place, the chief claims attorney. Where other roads deputize certain persons to serve on committees of safety the Santa Fe enrolls the services of each and every employee in the cause. Lectures are given in the shops and reading rooms by officers and men of prominence in other lines, with the idea of bringing home to each individual his responsibility, not only

The Safety Sign Over a Shop Door.

for his own safety, but for that of his fellow workmen and the patrons of the road, who are dependent upon the care which he exercises in the discharge of his duty, whether he be an engineer in charge of a train, a despatcher, operator, or a mechanic in the shops.

Ministers and priests of the various churches along the line have lent able support to the safety movement by holding special services for railway men, at which "safety" has been made the subject of sermons, and the virtue of caution as a conserver of life and limb has been extolled. The *Employees' Magazine,* which is published monthly and reaches every member of the great family, from the president to the Mexican section laborer, calls constant attention to the need of caution and through the medium of special articles, points out ways and means of circumventing the prevalent risks in the various branches of railway work.

Perhaps the most effective idea which has been developed is the use of the phrase, "Get the Safety Habit," and its practical adoption as a part of the Santa Fe symbol. Realizing that lectures and sermons may be heard and forgotten; that articles may be written, only to be read by the few, and that the effect of all may be annulled in a moment of thoughtlessness, the idea of the adoption of a catch phrase in conjunction with the road's emblem, as an ever present reminder, was an inspiration. The use to which this phrase has been put is well illustrated in the accompanying photographs of signs of various sizes, with which the walls of the shops have been decorated. It is not easy to forget to be careful, with the admonition to "Get the Safety Habit" constantly in view.

It is not to be understood that the adoption of a wide policy of education has in any way hindered a proper attention to details. Each shop is carefully inspected for the purpose of detecting the points of danger. Machine gears in such a position as to expose operators or passers-by to the danger of being caught and maimed are enclosed. Emery wheels are carefully guarded; pits are provided with covers or railing; dangerous practices, such as shooting bolts, are prohibited.

Safety committees are a good thing, and by their well directed efforts many accidents may be prevented. Safeguards in shops and safety appliances on cars and locomotives help to curtail the list of casualties. The elimination of grade crossings, the provision of effective right of way fences and the enforcement of stringent rules against trespass on the railway property, add their part to the general safety. But, after all has been done along these lines, there still remains the great majority of serious and fatal accidents, which no amount of foresight on the part of the management could have prevented; where no safeguard could have been provided, to secure their avertment—in short, the cases due to individual carelessness. The campaign which the Santa Fe is carrying out is not only directed toward the elimination of the class of accidents which lie strictly within the province of safety methods and devices, but also aims at the minimization of that greater class which may be curtailed only by inspiring each employee with a full realization of his responsibility.

THE PARCEL POST

For forty years the American people have demanded a parcel post. Forty-three foreign countries already have a parcel post, and there is no record of any foreign country ever having discontinued such a service after having started it

The first zone is quadrangular but not square in shape, since it is bounded on east and west by meridians of longitude which, of course, converge as they go north and diverge as they go south. All other zones are roughly circular in shape. Zone two includes all units of area outside zone one which lie either *wholly or in part* within a circle drawn from the center of a given unit of area, the circle to have a radius of 150 miles.

The third zone includes all the territory outside of zone two, within the radius of a circle of 300 miles, and with the same proviso that all units of area through which its boundary circle passes are a part of that zone. The fourth zone has a radius of 600 miles, the fifth zone a radius of 1,000 miles, the sixth zone a radius of 1,400 miles, the seventh zone a radius of 1,800 miles, and the eighth zone includes all units of area outside of zone seven.

The matter of units of area and of zones is somewhat complicated. But it seems much more complicated than it really is. The reasons for establishing such a system are clearly set forth by Senator Bourne, in his report on the post-office appropriation bill. There are at the present time some 60,000 post offices in the United States.

It costs now 64 cents to send four pounds of books either across the city, or across the continent. Under the parcel post law it will cost 8 cents to send the same package across the city and 48 cents to send it across the continent.—*Railroad Man's Magazine.*

MAINTENANCE OF PISTON VALVES

Methods Used in Machining Packing Rings and Bushings on the Eastern Railway of France.

The *Revue Ginerale des Chemins de Fer* recently published an exhaustive description of the methods pursued on the Eastern Railway of France in the maintenance of locomotive piston valves, which contains a number of features that may be taken as suggestions to American shop men. While the piston valves in use on this road are of what is generally known as the American type, they differ from those in use in this country in one essential particular. The valves in use here are generally rigidly attached to the valve rod, while the Eastern Railway valve, shown in Fig. 1, on the other hand, is free on its stem, which merely moves it back and forth, as in the case of the flat valve.

Since the expansions of the body of the valve and of the valve stem are not the same, not only because of the difference in the metals of which they are made, but also and especially because the two are held at quite different temperatures, the valve stem being in the exhaust, while live steam is in contact with the whole of the center of the valve, the valve is given, when cold, a longitudinal play of from .12 in. to .16 in. on saturated steam locomotives and from .16 in. to .20 in. on those using superheated steam.

The packing rings should be perfectly free in their grooves, so as to reduce their wear as much as possible and also insure their contact with the walls of the bushing, even when the latter is somewhat out of shape. No rings which carry the whole weight of the body of the valve can be free. On the other hand, in order to avoid steam leakages, which may occur through the slots at the ends of the rings, it is necessary that the central bronze ring should fit well in the grooves in the lower part of the valve and that the cuts in the rings should be opposite this portion. Further, the thickness of the latter should always be less than the depth of the grooves, as measured by the central ring. Under these conditions, the upper portion of the rings can be made the thicker, which makes it possible to obtain a rational form of ring, from the standpoint of the bending stresses to which it is subjected. Hence it is the center rings that must carry the valves and insure tightness at the cuts, while the end rings will be perfectly free in their grooves, and can so adjust themselves as always to be in contact with the walls and prevent any appreciable leakage.

Bushings.—The bushings are of cast iron and are provided with copper rings at each end, which, by their larger ratio of expansion, insure tightness. The bushings are turned to an outside diameter about .001 in. greater than that of the steam chest, and can be pressed in place cold by means of screws and straps. The method preferred, however, is to heat the cylinders, which presents no difficulty at all when the work is done where the locomotive can be put under steam pressure. The flow of steam to the cylinder must be cut off, while that to the steam chest is unimpeded. In this way the casting is expanded and the bushings are put quickly in place and are held by a bolt until all parts are cold. The use of hot setting has the great advantage of not straining the metal around the openings, which happens when the bushings are pressed in cold. This frequently puts an excessive stress on the metal, which may be the means of starting a crack.

When the bushings are set in this way it is very seldom that they fail and have to be replaced prematurely, and they frequently run for from 220,000 to 250,000 miles.

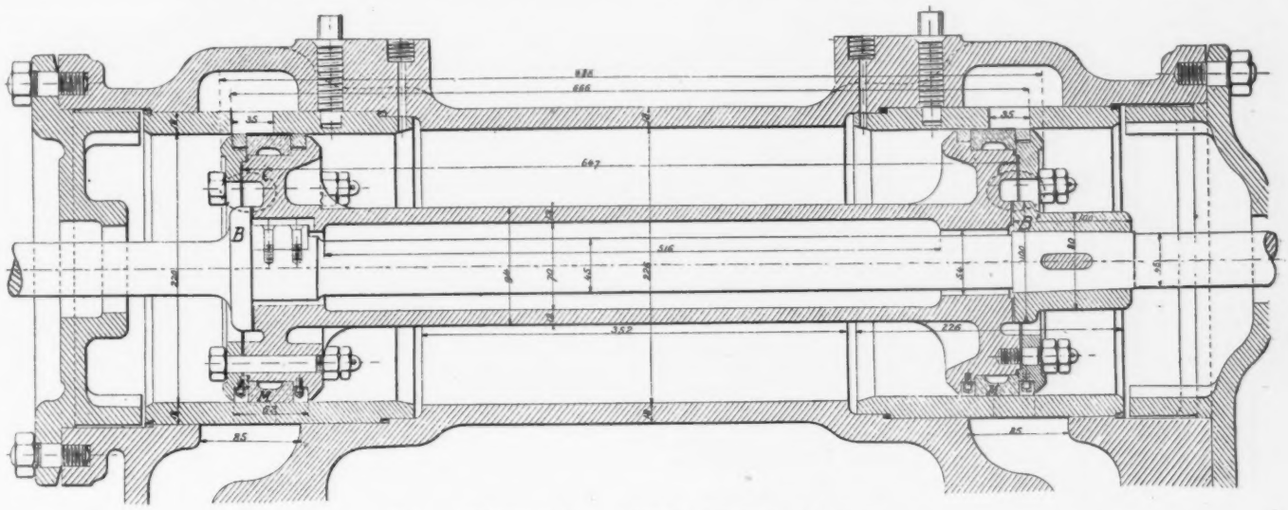


Fig. 1—Piston Valve; Eastern Railway of France.

As for the internal finish, it should always be done with the bushing in place in order to cut out the distortions of the surface that are frequently produced by the setting, especially on a line with the circular admission port, a point where the bushings are apt to bulge outwardly, while, on the other hand, they are apt to bend in at the points where they are in contact with the solid metal of the steam chest.

The two diameters, one opposite a recess and the other opposite solid metal, frequently show a difference of from .006 to .008 in.; also two diameters on the same circle, which are equal when cold, will vary from .008 in. to .01 in. when hot. These figures show that, when heated, the steam chests are subject to deformations which, in proportion to their extent, tend to increase the ellipticity of the section resulting from wear, which is always the greatest at the bottom. Therefore, if tightness is to be obtained, it is necessary to use packing rings that are carefully made and as elastic as possible.

Packing Rings.—When piston valves were first used, the valve rings were made in accordance with the old method used for piston rings, which was as follows: d being the diameter of the steam chest or cylinder; d^1 that of grooves

of the valve body or piston: c the length of cut needed to obtain the "spring" considered necessary; a ring was cut from a shell of suitable dimensions, whose outside and inside diameters, D and D^1, were as follows:

$$D = d + \frac{c}{\pi}$$

$$D^1 = d^1 + \frac{c}{\pi}$$

This ring was then faced to a width corresponding as closely as possible to those of the grooves in the valves or pistons. After having been cut, the rings were fitted to their grooves and the ends filed so as to permit of a free movement in the steam chests or cylinders, a play of about .02 in. being left between the ends for expansion along the line of the smallest

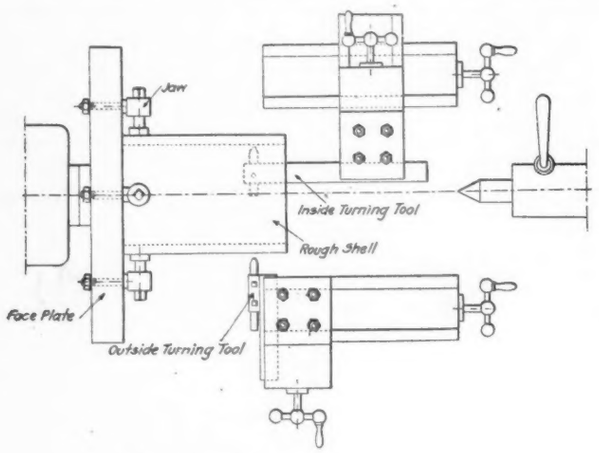


Fig. 2—Turning and Boring the Shell.

diameter. But all this work, which was done, for the most part, with a file, was long and expensive; while the rings made in this manner were not round, but tended to assume an oval shape as in Fig. 9, which caused constant leakages and unequal wear in the bushings and cylinders. Furthermore, this method was frequently very annoying, because the workman who made the rings was obliged to wait for the valve bodies and piston heads to be finished in order to get the exact diameter and width of the grooves.

In order to avoid these inconveniences, a complete change has been made in the method of machining rings for both the

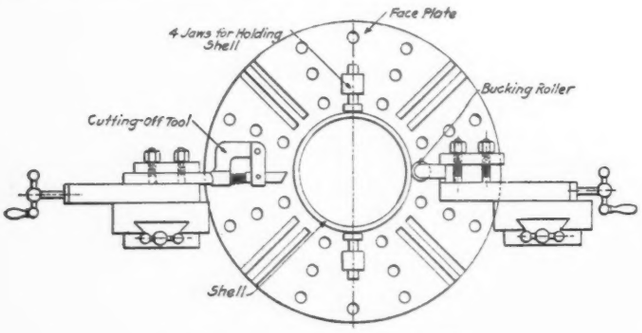


Fig. 3—Cutting Off the Rings.

valves and cylinders, and now all of the work is done on the lathe, and no attention is given to any other workman.

In the present method the different operations may be divided in two classes, viz.: Those that can be performed in advance, thus working in with the regular shop routine, and those which can only be done after the measurements of the grooves in the valves have been obtained.

The two series of operations include: (1) The roughing off of the shells and the cutting of the rough rings; (2) the cutting of the rings to width, the cutting of the slot and the turning of the outside and inside eccentrically.

In any well-organized shop there should always be on hand enough rough rings to fit out one or two engines of each class. These should be prepared in what may be called leisure time,

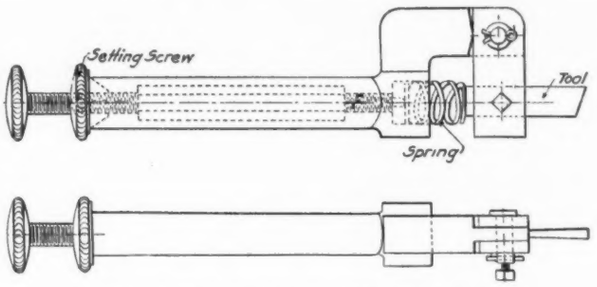


Fig. 4—Tool for Cutting Off the Rings.

or when no other work is pressing. Given a ring to be finished from the rough condition, it should be large enough to be cut in accordance with a rule established by experience, with a kerf that is usually .07 of the diameter, and then to be turned so as to eliminate the oval form and make it truly circular. It should be noted that the deformation of the rings after cutting is an important matter, and that it varies with the diameter and the thickness of the rings, so that it is necessary to ascertain experimentally the diameter that should be given to the rough rings.

When these diameters have been determined, a shell of the proper size should be taken and mounted, as shown in Fig. 2, in a lathe fitted, if possible, with two tool posts set on the same carriage. The cutting speed may then be taken at from 46 ft. to 50 ft. per minute, with a feed of about .04 in., and taking two cuts at once, one inside and one outside. It is also a good idea, in order to prevent chattering and facilitate centering, to have the jaws of the chuck on the face plate turned to fit the drum.

The shell having been turned to the proper size, the rings

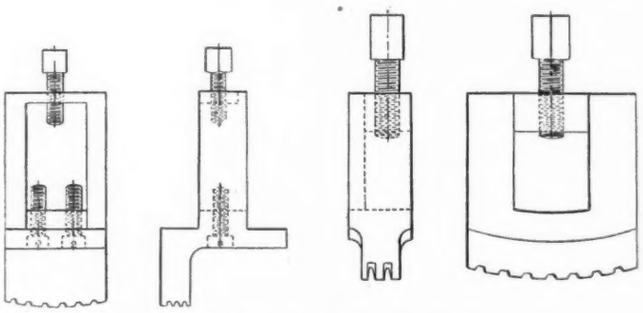


Fig. 5—Jaw for Universal Chuck.

are cut off with a width from .08 in. to .12 in. wider than the grooves which are to receive the finished rings. The method of cutting the rings is shown in Fig. 3. The special cutting-off tool is mounted on the front carriage, while a roller is attached to the one at the back and is intended to hold the shell up in place and prevent it from springing away from the cutting tool. The cutting-off tool that has given the best results is shown in Fig. 4. It is pivoted and provided with an abutting spring, which rests against a regulating screw, by which not only the tension of the spring can be regulated, but the cutting angle of the tool as well. With this arrangement a high output can be obtained without any danger of breaking the tool, because the spring acts as a regulator and prevents the digging in of the tool, in spite of coarse grain and hard

spots that are so often found in cast iron. The cutting speed is practically the same as that for the turning, namely, from 46 ft. to 50 ft. per minute.

The work of finishing the rings is assigned, as far as possible, to the lathe hand who straightens the grooves, and is performed as follows:

Rings of the proper diameter are held in a universal chuck.

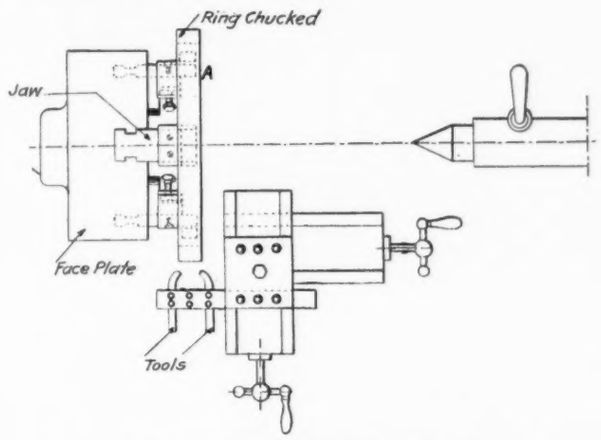


Fig. 6—Cutting the Rings to Width.

The jaws of the chuck are a little narrower than the grooves in the valve, as shown in Fig 5. The rings are held, as at *A*, Fig. 6; their sides are faced and brought to size by means of double tools, as shown in Fig. 7, which are easily adjusted by a gage of sheet metal, which is introduced between them, after it has first been put in the groove and marked. The workman then has nothing to do except feed in the cross carriage to finish the rings to width. The cutting speed ranges from 52 ft. to 59 ft. per minute.

For cutting the kerf, an arbor, *A*, Fig. 8, fitted with a shoul-

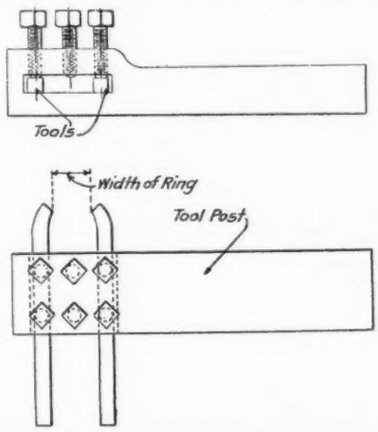


Fig. 7—Tool for Cutting Rings to Width.

der is used. On it are mounted two circular saws about 4.75 in. in diameter and about .05 in. thick. The eye is about 1.18 in. in diameter and is notched for the key. These saws are separated by rings, so that the distance between their outside faces is equal to a trifle less than the length of the kerf. The whole is held tight by a nut and washer in the usual manner.

Four rings are then set, one over the other, on the tool carriage and clamped and cut by the two saws acting together. The latter are run at a speed of about 90 revolutions per minute, and the carriage is run in until all of the rings are cut through. The time required for setting the rings, cutting and taking them out of the machine, varies from two to three minutes. After the ends have been filed off to fit, they are ready for the outside and inside turning.

When the rings are closed after the kerf has been cut, they will assume an oval form, which must be entirely done away with, if it is desired to avoid the excessive leakages that are sure to occur where the rings do not fit closely against the circular walls of the bushings. On the other hand, we have seen that, in order to be perfectly free in its place, a valve ring should always be thinner at the bottom, that is at the ends, than the depth of the groove measured on a radial line. At the same time, the thickness at the top should be appreciably greater, in order that it may take up, as far as possible, the greater space resulting from the eccentric position of the valve, which is constantly carried on the bottom of the bushings, as is shown in Fig. 1, if leakage through the split in the rings is to be avoided. The width of the opening in the rings,

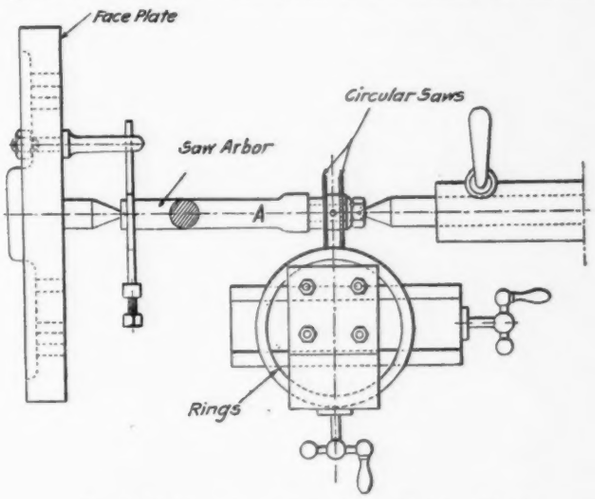


Fig. 8—Cutting Piece Out of the Packing Ring.

when in place, is about .02 in. at the smallest diameter, but increases with the wear of the rings and the bushing.

The rough turned rings are drawn together by flexible straps, as shown in Fig. 9.

Between the ends of each ring a sheet of metal, about .02 in. thick, is placed to correspond to the normal distance between them when in place. The rings thus clasped are mounted on a special fitting, as shown in Fig. 10, which consists of two plates of the same diameter, of which No. 1 is screwed to the lathe spindle, while the other, No. 2, is mounted on the first by means of four studs. The holes for these studs in plate No. 1 are slightly elongated to permit of a displacement cor-

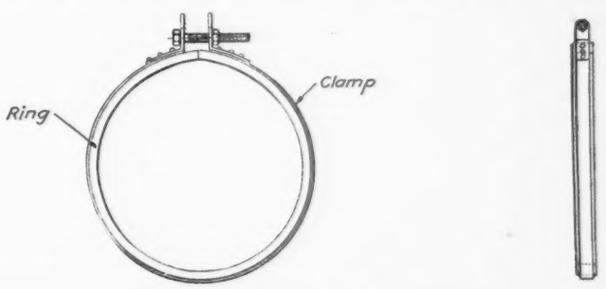


Fig. 9—Clamp for Packing Ring.

responding to the eccentricity of the rings. The drum *C*, of proper dimensions to receive the clasped rings, is automatically centered on the plate *A*.

When the two plates are bolted together in perfect concentricity, the clasped rings are put on the drum, taking care to place the ends opposite the holes for the holding studs of *A*. This position is then marked on the plate. A ring of somewhat smaller diameter is then put between the plate and the first packing ring, in order to protect the device from mutila-

tion. The last ring at the outside projects a little beyond the drum and is held in place by means of a spherical block, or cap, held by a nut and washer. The straps which have served to hold the rings are then removed, and the outside is turned by taking two cuts. The first makes the rings round, while the second, which can be adjusted if the rings are to be of different diameters, brings them down to size; that is to say, to a size corresponding accurately to the smallest diameter of

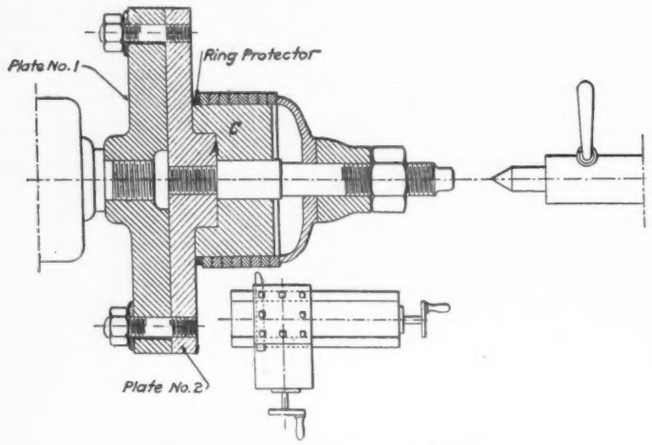


Fig. 10—Turning Outside of Rings.

each bushing. The play of .02 in. provided between the ends of the rings to meet this diameter, is obtained by the .02 in. sheet, previously inserted, which remains in place.

When the finishing cut has been taken it is well to take a very light chamfering cut at the joints between the rings, so as to remove any burrs which might have a tendency to act as scrapers and remove the lubricant. Finally the surface is polished, so that when they are put in service the rings may be as frictionless as possible.

It then only remains to finish the inside. For this purpose, and without dismounting the rings, a crown, shown in Fig. 11, is bolted to plate No. 2, which has a bearing on about the outer half of the rings. It is held in place by four bolts. When this crown has been so tightened that it will hold the rings, the holding nut is run back and the holding cap removed, as well as the centering drum. Plate No. 2 is then moved over No. 1, so as to obtain the necessary eccentricity, and the insides of the rings are turned to give a play between the bottom of the groove and the ring of from .008 in. to .012 in. at the top.

The inner edges are also chamfered in order to avoid the sharp angles which might prevent the rings from seating on the bottom of the grooves.

The rings are then taken down and inspected singly; drilled diametrically opposite the kerf with a hole about ¼ in. in diameter to receive the pin which is to prevent turning.

This method produces rings of proper form and accurate

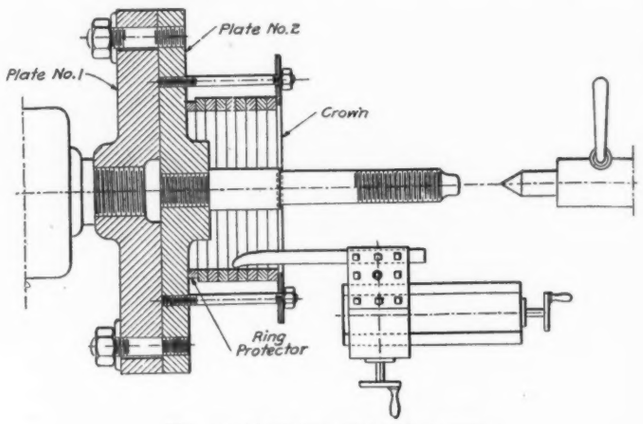


Fig. 11—Turning Inside of Rings.

dimensions, besides being far more rapid and economical than the old method.

When piston rings are to be turned, in order to avoid using the self-centering drum, a cam apparatus is employed, which is based upon the same principle as is used for automatically centering the exhaust nozzles and the threads used for setting guides. This apparatus is shown in Fig. 12. No eccentricity is given to the piston rings, since the piston rods and extension rods should be kept at the true axis of the cylinder.

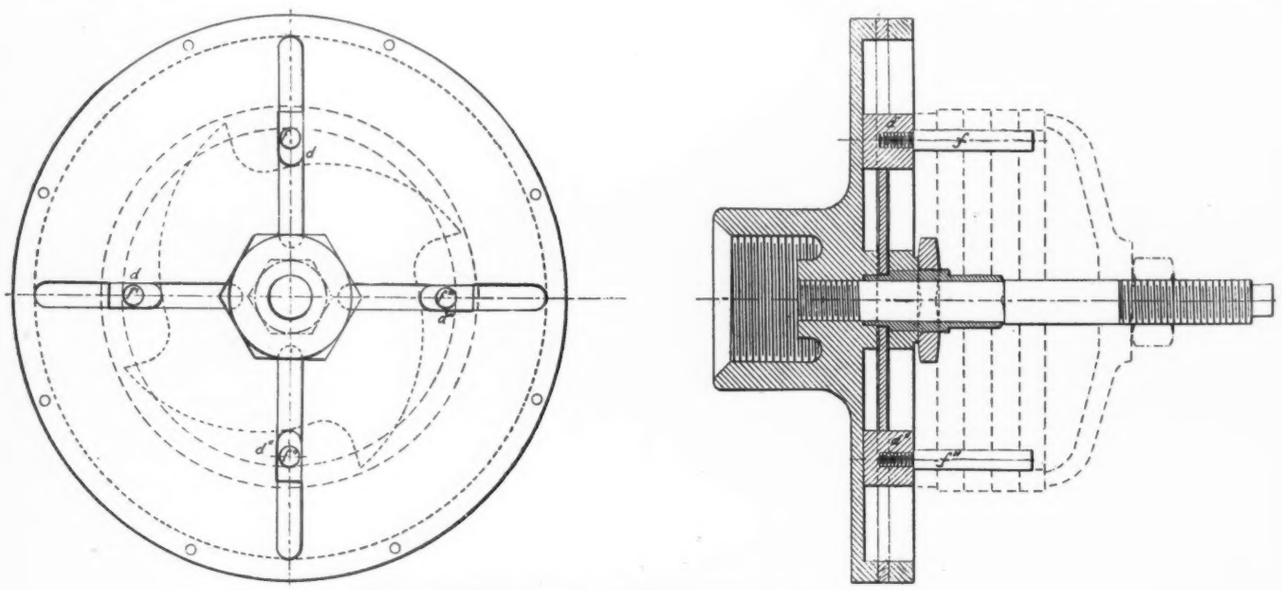


Fig. 12—Apparatus for Centering Inside of Piston Rings.

When piston valves were first used, the center, or bull rings, were made of cast iron, but for the sake of preserving the bushings, which should, as far as possible, be kept from wearing oblong, bronze was later substituted for the cast iron.

These rings are fitted to rub lightly on the body of the valve, while, on the outside, they are turned to a diameter .02 in. less than that of the bushing. With this, the rings are free to expand without any increase of frictional resistance. These

bull rings ought to bear upon the bottom of the bushings so as to insure the necessary tightness on a line with the ends. The wear on them is confined to a rather limited arc, so that they last for a long time; and when they are to be repaired it is sufficient to turn them through 90 deg., so that they can always retain their original thickness at the bottom. This expedient, which has no disadvantage, usually extends the life of the rings to the time when they will have to be replaced because of the reboring of the bushings; that is, after a life of from 112,000 to 125,000 miles.

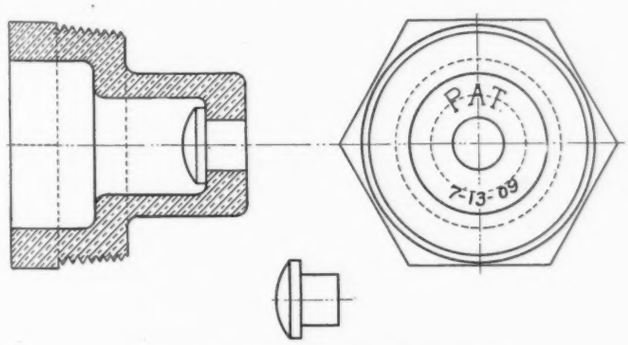
SHONFELT-VAUGHAN FUSIBLE PLUG

BY E. S. DEWAY.

A new design of safety or fusible plug has been in experimental use for several years on the locomotives of the Southern Pacific and on several occasions has given warning which prevented serious boiler explosions.

This plug is shown in the illustration and consists of a brass body properly threaded for screwing in the crown sheet and arranged to extend well above the upper surface of the sheet. This upper projection has a fair sized opening at the top in which is fitted a brass plug with a head, somewhat less in diameter than the space in the body around it. This plug is closely fitted in the opening but is not tight. Its end is flush with the top of the body so as to prevent any collection of scale at this point. A seal of tin or other metal, fusible at a comparatively low temperature, is interposed between the head of this plug and the brass body and fuses the two parts together.

It will be seen that the seal of fusible metal is entirely separated



Shonfelt-Vaughan Fusible Boiler Plug.

from the water space above the crown sheet and is thus exempt from the liability of corrosion and it is also protected from the direct action of the heat in the firebox. A characteristic feature of the seal is that it is not connected to the body or the disc by any form of interlocking projections. When the water in the boiler is at the proper height the seal is protected by the cooling action of the water surrounding the body of the plug and is also somewhat insulated from the heat of the firebox by being set at a level higher than the crown sheet and inside a cavity. When the water level becomes too low the fusible metal will soften and release the small brass plug which is immediately blown out by the pressure of the steam above it and a fair-sized opening is given for escaping steam which will deaden the fire and give an unmistakable warning of low water.

Experience with fusible plugs fitted with babbitt alone has shown that they frequently soften and let the steam pass through at one point, but that the remainder of the metal is then cooled and kept at a low temperature by the escaping steam so that a positive and unmistakable warning is not given. It is for this reason that the brass plug, sealed in place, is used in this design. Experience has shown that when it once reaches the fusing temperature there is no possibility of the plug remaining in place and not giving the necessary warning.

TEMPERATURE TESTS ON SUPERHEATER LOCOMOTIVES

Some interesting results, in connection with the temperature of various points in a locomotive boiler fitted with a Schmidt superheater, have been obtained by Prof. Lomonsoff and M. Czeczott, on the Tashkent Railway in Russia. The locomotive on which the tests were made had cylinders 21.6 in. x 27.6 in., driving wheels 72 in. in diameter, and a total heating surface of 2,210 sq. ft., of which 441 sq. ft. was superheater surface. The length of tubes was 14 ft. 6 in., grate area 30 sq. ft., steam pressure 191 lbs., and the locomotive weighed

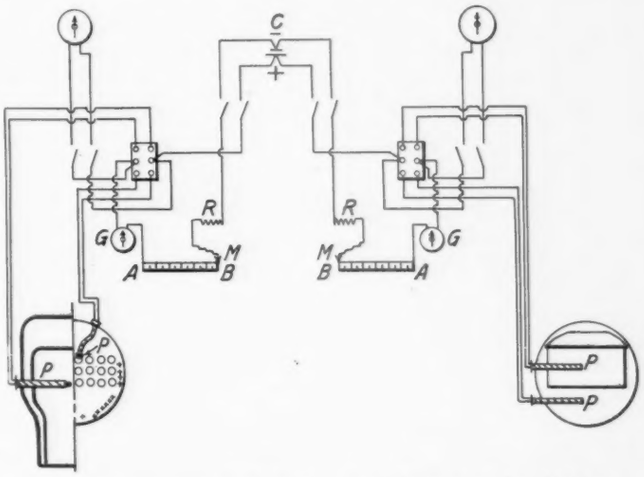


Fig. 1—Arrangement of Wiring and Apparatus for Making Temperature Tests.

about 73 tons. The return bends of the superheater elements were 26.8 in. from the tube sheet.

An account of these tests was published in *The Engineer* (London), July 26, from which the following has been taken: These tests relate principally to the variation of the temperature of the gases of combustion under different conditions of working. The apparatus employed is shown diagrammatically in Figs. 1 to 3. Figs. 1 and 2 show a locomotive boiler fitted with pyrometers for taking different temperature measurements. The pyrom-

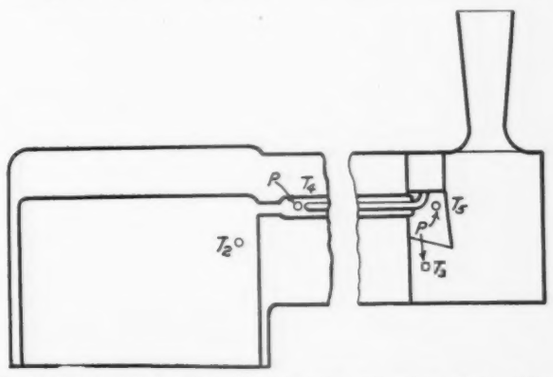


Fig. 2—Points at Which Temperature Readings Were Taken.

eters are marked *P*, and it will be seen that measurements were taken at four points. One point is in the firebox, at a position denoted in the diagrammatic longitudinal section of the boiler as T_2. Another point was at T_3 in the smokebox. These two records give the temperature of the gases of combustion entering and leaving the ordinary boiler tubes of the locomotive. Two other measurements were recorded, viz., at points denoted by T_4 and T_5. These two records give the temperatures of the gases of combustion feeding the superheater elements—the first the temperature of the gases as they

reach the bend of the superheater tubes, and the second as they leave the superheater. It is believed that this is the first attempt to take temperature records within the large smoke-tubes at a point such as that denoted by T_4.

The wiring for the instrument is shown in Figs. 1 and 3. The method employed was devised by Mr. Kroukovsky, professor of electro-technics at the High School of Mining at Ekaterinoslay. Its essential feature is that, instead of using sensitive voltmeters in connection with the pyrometer, a compensated galvanometer is used, and the apparatus so arranged that all readings are taken with the pointer at zero. The result of this is that a substantial instrument, little likely to be affected by the vibration of the train, can be used, and yet accurate readings obtained. In the installation under notice the instruments are in duplicate, and the connections for the four pyrometers are taken to two switches, so that readings for all four can be taken on two scales. The reading instruments were all in the dynamometer car behind the tender. In the diagram, Fig. 1, *C* represents the cell; *G, G* represent the galvanometers, of about 4.5 ohms resistance; *R, R* the rheostats; *A, B, A B* scaled resistances; and *M M* cursors with slide over the scales *A B, A B*. Two check instruments are also inserted in the circuits. When taking records the cursor *M* is moved along the resistance *A B* until the galvanometer pointer is at zero, when the reading of the scale *A B* gives a measurement of the temperature. The method of inserting the pyrometer into the large smoke tubes, in order to secure temperatures at the point T_4, is shown in Fig. 3, as is also the manner in which the connections for this pyrometer were carried through the boiler shell.

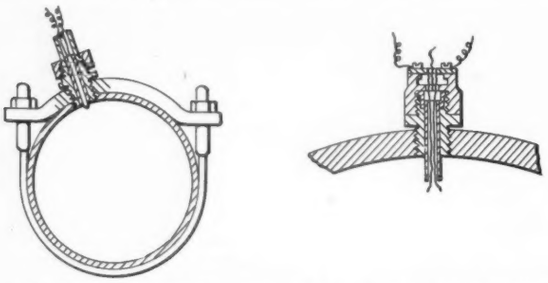


Fig. 3—Method of Inserting Pyrometer in Large Superheater Flue and of Carrying Connections Through the Boiler Shell.

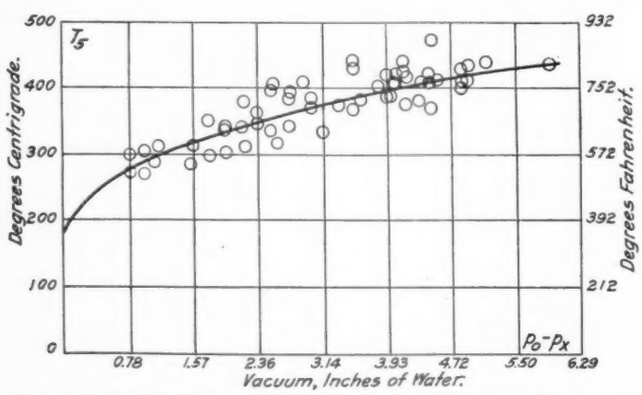


Fig. 4—Typical Readings Showing How Curves Were Plotted.

The results of some of the experiments are shown in Figs. 4 and 5. These are plotted to vertical scales of degrees, and to horizontal scales of smokebox vacuum in inches of water. Fig. 4 shows a typical curve, with the actual points as recorded. A feature of considerable interest which may be noticed in connection with the temperature of the gases leaving the barrel, is that at the higher rates of working the temperature of the gases leaving the superheater tubes in less than that of the gases leaving the ordinary boiler tubes. This suggests that the resistance at the higher rates becomes too great in the large smoke-tubes for the gases of combustion to be divided between them and the ordinary boiler tubes in the same ratio as happens at low rates of combustion. The inference naturally must be that superheat does not increase, as it is often contended it does, at a rate varying directly with the rate of combustion or draft, but that the rate falls off at the higher rates of working. This is confirmed by a study of other tests. It was found that moisture was present in the steam at the dome, usually to the amount of 4 to 5 per cent., while many instances of 10 per cent. moisture had been recorded. These figures confirmed results obtained by these experimenters independently on the Ekaterinynsky and Rybynsky railways; and it is their opinion that these are ordinary figures for waters containing appreciable quantities of carbonates.

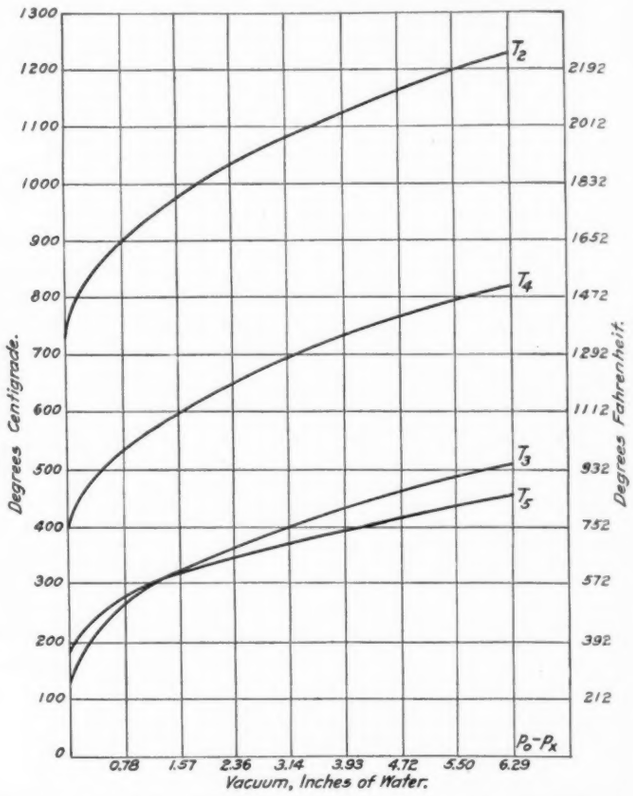


Fig. 5—Curves for Temperatures at Four Points Under Different Intensities of Draft.

Lunch Counter Car.—A lunch counter car has been installed on the Southern Pacific between San Francisco and Los Angeles, Cal. The counter extends the length of the car along one side, with the regulation stools in front of it. Meals will be served at all hours.

Condition of Farm Products in the U. S.—The Department of Agriculture has prepared an average for this year of all of the farm crops throughout the United States. Preliminary estimates of production have been made of certain crops as follows, with comparisons and farm prices for November 1, for the past two years:

Crops.	Production.			Price.		
	1912. Preliminary.	1911.	1910.	Nov. 1, 1912.	Nov. 1, 1911.	Nov. 1, 1910.
Corn, bu.....	3,169,137	2,531,488	2,886,260	58.4	64.7	52.6
Wheat, bu.....	720,333	621,338	635,121	83.8	91.5	90.5
Oats, bu.....	1,417,172	922,298	1,186,341	33.6	43.8	34.9
Barley, bu.....	224,619	160,240	173,832	53.8	84.9	55.3
Rye, bu.....	35,422	33,119	34,897	68.8	83.1	71.6

ERECTING SHOP KINKS

BY JAMES STEVENSON,
Gang Foreman, Pennsylvania Railroad, Olean, N. Y.

CROW-BAR SUPPORT.

The arrangement shown in Fig. 1 is made of bar iron, 4 in. wide x ½ in. thick, and is so constructed that it will rest on the floor and provide a good support, through one of the 2 in. holes drilled in the upright portion, for a crow-bar while

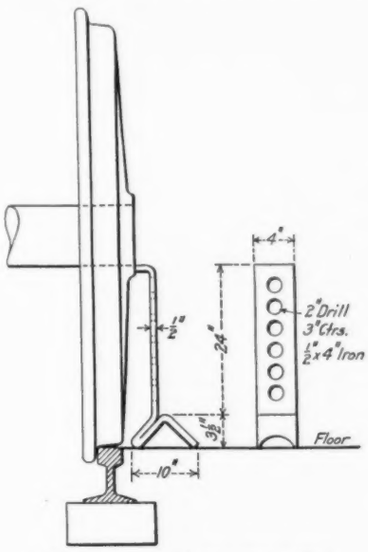


Fig. 1—Support for Crow-Bar.

lifting the pedestal braces in place. It is light and easily handled, and can be made in any blacksmith shop. It will also prove useful for other classes of work, where it is necessary to get a series of different lever heights for crow-bars.

APPLYING AIR PUMPS TO LOCOMOTIVES.

The device shown in Fig. 2 has proved satisfactory for removing and applying air pumps to locomotives. It consists

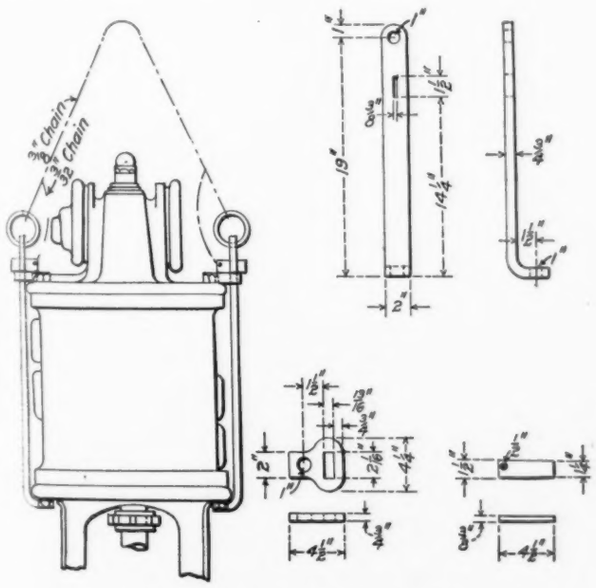


Fig. 2—Arrangement for Lifting Air Pumps.

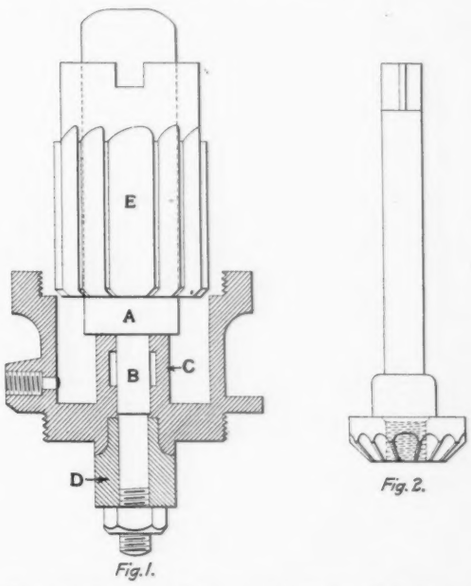
of two supports made of 2 in. x ¾ in. bar iron which hook on the lower steam cylinder head studs of the pump. Sliding lugs slip over the top studs and are held in position by a tapered key. Rings are provided at the top of the supports for a ⅜ in. chain. This provides a positive grip on the pump and when the arms are placed diametrically opposite, the pump may be raised in a vertical position. The arrangement is safe, as the two lugs cannot slip from the studs after the taper key has been driven in. This key is held to the ⅜ in. chain by a small chain, so that it will not be lost.

AIR PUMP GOVERNOR REPAIRS

BY J. A. JESSON,
Air Brake Foreman, Louisville & Nashville, Corbin, Ky.

A method of boring out the steam cylinder of a 1-in. air pump governor is shown in Fig. 1. The arbor *A* has a stem *B* which has a close fit in the guide *C*. It is held fast to the top of the guide by the nut on the end of the stem and the steel washer *D* which has a close fit in the recess at the lower end of the guide *C*. The lower end of the stem is turned down to ⅜ in. to receive a standard nut. This part also serves as an arbor for a milling cutter to true up any irregularities on both ends of the guide. The reamer *E* should have a snug fit on the arbor and should be ground for cutting brass.

These cylinders can be bored out to ⅛ in. larger than their



Reamers for Repairing an Air Pump Governor.

original diameter, as the manufacturers furnish pistons and rings for every additional 1/32 in. up to that limit. The steam valve stems are made larger than the standard sizes in increments of 1/64 in. Since the steam valve and piston are rigidly connected it is necessary that the guide should be bored each time the cylinder is bored, which may be done by a sensitive drill or a bench drill, standard fluted reamers being used. Fig. 2 shows a reamer for facing off the steam valve seat of the governor which is often out of line with the valve guide due to the warping or springing of the metal. The reamer is screwed on the shank so that it may be used with a shank that exactly fits the valve guide. Where the valve seat is cut too deep, a facing reamer should be used to cut it down.

EQUIPMENT ON THE FEDERATED MALAY STATES RAILWAY.—In February, 1912, the Federated Malay Railway had in service 114 locomotives, of which 33 were of Pacific type, 38 of the ten-wheel type, and 43 were smaller engines. On the same date there were 2,229 freight cars of various types and 271 passenger cars.

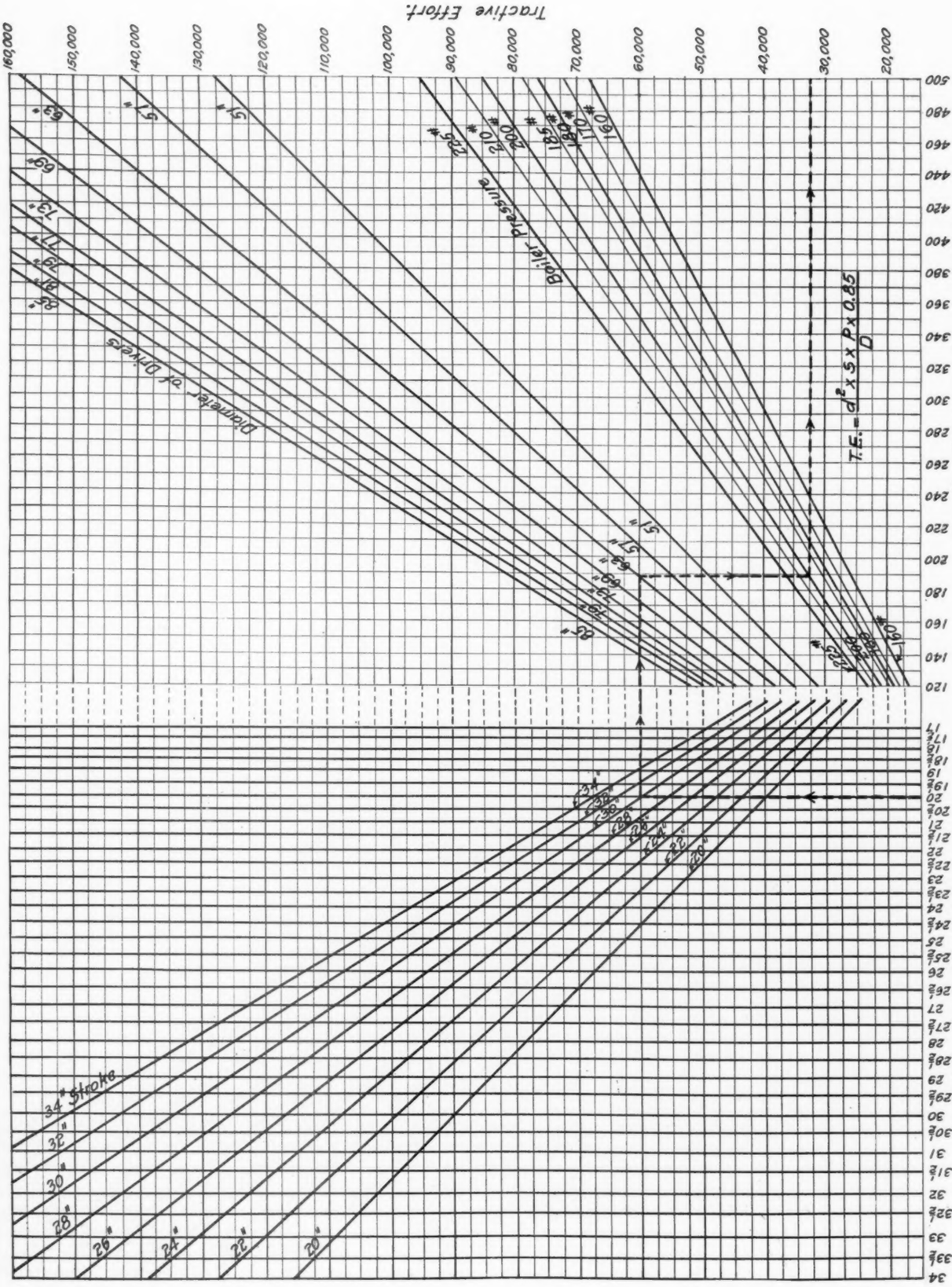


Chart for Obtaining Quickly Either the Total Tractive Effort or the Tractive Effort Per Pound of Mean Effective Pressure.

CHART FOR OBTAINING TRACTIVE EFFORTS

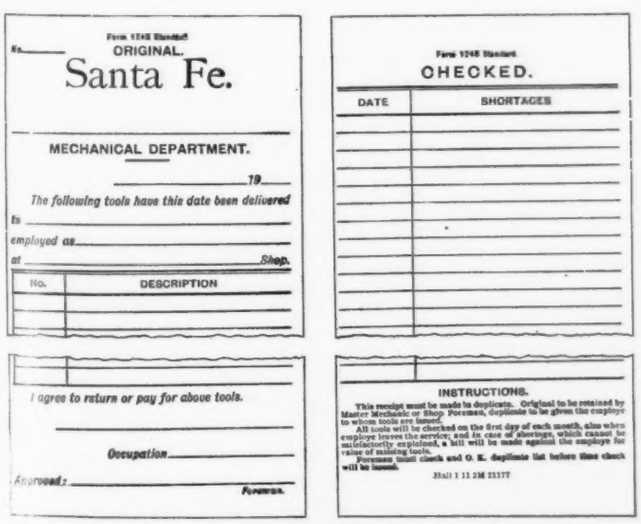
BY L. R. POMEROY.*

A locomotive tractive effort formula contains four variables and in the preliminary investigation of a proposed design it not infrequently is desirable to ascertain the effect of changes in each or all of them. While the tables available permit a ready determination of tractive effort for exact sizes, it is sometimes necessary to know the effect of an increase of one-quarter inch in the diameter of the cylinder or the wearing down of the tires which would decrease the diameter of the drivers by small amounts. Furthermore for a complete range, the tabular arrangement of this data makes a fairly voluminous pamphlet. In view of these facts the accompanying chart has been prepared and will be found to give results that are accurate within 500 lbs. It is based on a mean effective pressure equal to 85 per cent. boiler pressure.

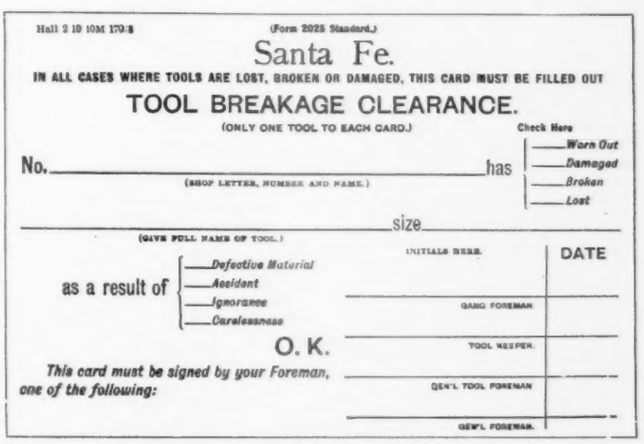
In obtaining the tractive effort of an existing locomotive the chart is entered from the bottom of the left hand section at the proper diameter of cylinders. This line is followed to the intersection of the diagonal line corresponding to the stroke and then horizontally to the intersection of the diameter of drivers and then downward to the boiler pressure and horizontally to the right hand scale, where the tractive effort will be found. If the tractive effort per pound of mean effective pressure is desired, the boiler pressure curves are not considered and the line is carried directly down from the diameter of drivers to the scale at the bottom of the sheet. The example shown as an illustration is a 20 in. x 30 in. cylinder, 63 in. wheels and 200 lbs. boiler pressure. It shows that the tractive effort is slightly less than 32,500 lbs., and the tractive effort per pound of mean effective pressure is about 190 lbs.

CHECKING TOOL OUTFITS

At the last meeting of the Railway Tool Foremen's Association, there was considerable discussion on checking systems for tools, and it was finally recommended by the association that there should be a charge placed on each tool check issued to a workman. In this connection, the system in force on the Santa Fe for issuing a set of tools to a man when he first enters the service and afterward keeping track of them, was mentioned. When a workman enters the service of that road he is issued a set of tools varying as to number and kind depending on his work, and Form 1248, shown in one of the illustrations, is filled out in duplicate giving the number of chisels, hammers, wrenches, etc., in the spaces provided. This list is signed by the workman, who thereby agrees to return or to pay for all of the tools on the list. The original is filed in the tool room and the duplicate is given to the man. On the back of this form is a space for entering the date and any shortages that may be found when the list is checked over. All the tools in the shop are checked on the first of each month and also when the employee leaves the service. If any shortage that cannot be satisfactorily explained is discovered, the employee is required to pay for the missing tool. An employee desiring to leave the service, after having his tool list checked over is given a copy of Form 1279, which must be properly filled out and signed before he can receive his time check.


ORIGINAL.
Santa Fe.
MECHANICAL DEPARTMENT.
19
The following tools have this date been delivered
to
employed as
at Shop.
No. DESCRIPTION
I agree to return or pay for above tools.
Occupation
Approved:
Foreman.
CHECKED.
DATE SHORTAGES
INSTRUCTIONS.
This receipt must be made in duplicate. Original to be retained by Master Mechanic or Shop Foreman, duplicate to be given the employe to whom tools are issued.
All tools will be checked on the first day of each month, also when employe leaves the service, and in case of shortage, which cannot be satisfactorily explained, a bill will be made against the employe for value of missing tools.
Foremen must check and O. K. duplicate list before time check will be issued.

Face and Back of the Receipt for Tools which is Signed by the Workman.


Hall-2-07-5M-4657
(Form 1279 Standard.)
SANTA FE.
(Insert name of Railway Company.)
ORDER FOR TIME CHECK.
.....190..
TIMEKEEPER:
Please issue Time Check to.....
Number.....for services during.....190.., as.....
.....
Foreman.
Tool List checked up and found to be.....
Tool Room Foreman.
Locker Key.....
General Foreman.
THIS ORDER MUST BE PRESENTED before a time check is issued

Hall 2 10 10M 170:8 (Form 2025 Standard.)
Santa Fe.
IN ALL CASES WHERE TOOLS ARE LOST, BROKEN OR DAMAGED, THIS CARD MUST BE FILLED OUT
TOOL BREAKAGE CLEARANCE.
(ONLY ONE TOOL TO EACH CARD.)
Check Here
No. has
Worn Out
Damaged
Broken
Lost
(SHOP LETTER, NUMBER AND NAME.)
size
(GIVE FULL NAME OF TOOL.)
INITIALS HERE. DATE
as a result of
Defective Material
Accident
Ignorance
Carelessness
GANG FOREMAN
O. K.
TOOL KEEPER.
This card must be signed by your Foreman, one of the following:
GEN'L TOOL FOREMAN
GEN'L FOREMAN.

Clearance Card for Lost or Broken Tools.

When a workman enters the service of that road he is issued a set of tools varying as to number and kind depending on his work, and Form 1248, shown in one of the illustrations, is filled out in duplicate giving the number of chisels, hammers, wrenches, etc., in the spaces provided. This list is signed by the workman, who thereby agrees to return or to pay for all of the tools on the list. The original is filed in the tool room and the duplicate is given to the man. On the back of this form is a space for entering the date and any shortages that may be found when the list is checked over. All the tools in the shop are checked on the first of each month and also when the employee leaves the service. If any shortage that cannot be satisfactorily explained is discovered, the employee is required to pay for the missing tool. An employee desiring to leave the service, after having his tool list checked over is given a copy of Form 1279, which must be properly filled out and signed before he can receive his time check.

If on checking over at the first of the month or at any other time it is found that any tool is lost or damaged, Form 2025 is filled out and properly signed, which acts as a release for any shortage shown on the back of Form 1248. This form is used for tools that are permanently in the man's possession, as well as those which he draws from the tool room. In the latter case, the presentation of this clearance card, properly filled out, permits the man to recover his tool check.

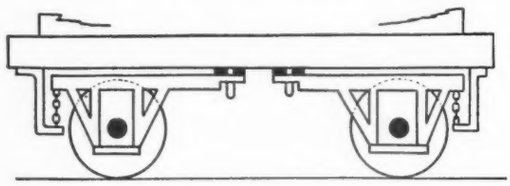
TAIL END TRAIN MARKERS.—The Philadelphia & Reading has decided to use lamps for tail end markers for trains, in the day time as well as at night, in place of the green flags.

*Consulting Engineer, New York.

NON-PARALLEL AXLE TRUCKS

A construction for four-wheel trucks, which does not require the axles to maintain even an approximately parallel position is being tried experimentally on several foreign electric railways. This design was originated and is controlled by the Warner International and Overseas Engineering Company, Ltd., of London. In a general way the system might be described as consisting of two radial trucks, arranged in a manner similar to a two wheeled engine truck, which are pivoted at or near the center of the main truck frame. The main frame is supported by a flexible connection at each of its four corners, as well as at the one or two pivot pins.

This arrangement in its simplest form is shown diagrammatically in the accompanying illustration, which was used in the columns of *Engineering* of London. Here the truck frame is



Diagrammatic Illustration of the Warner Non-Parallel Axle Truck.

shown as supported by chains at each corner and with separate pivot pins. In actual practice links, arranged for radial movement, are used in place of the chains at the corners. It will be seen that when either of the two radial trucks is deflected to one side that end of the frame will rise and a pull will be transmitted to the truck which will tend to restore it to its normal position.

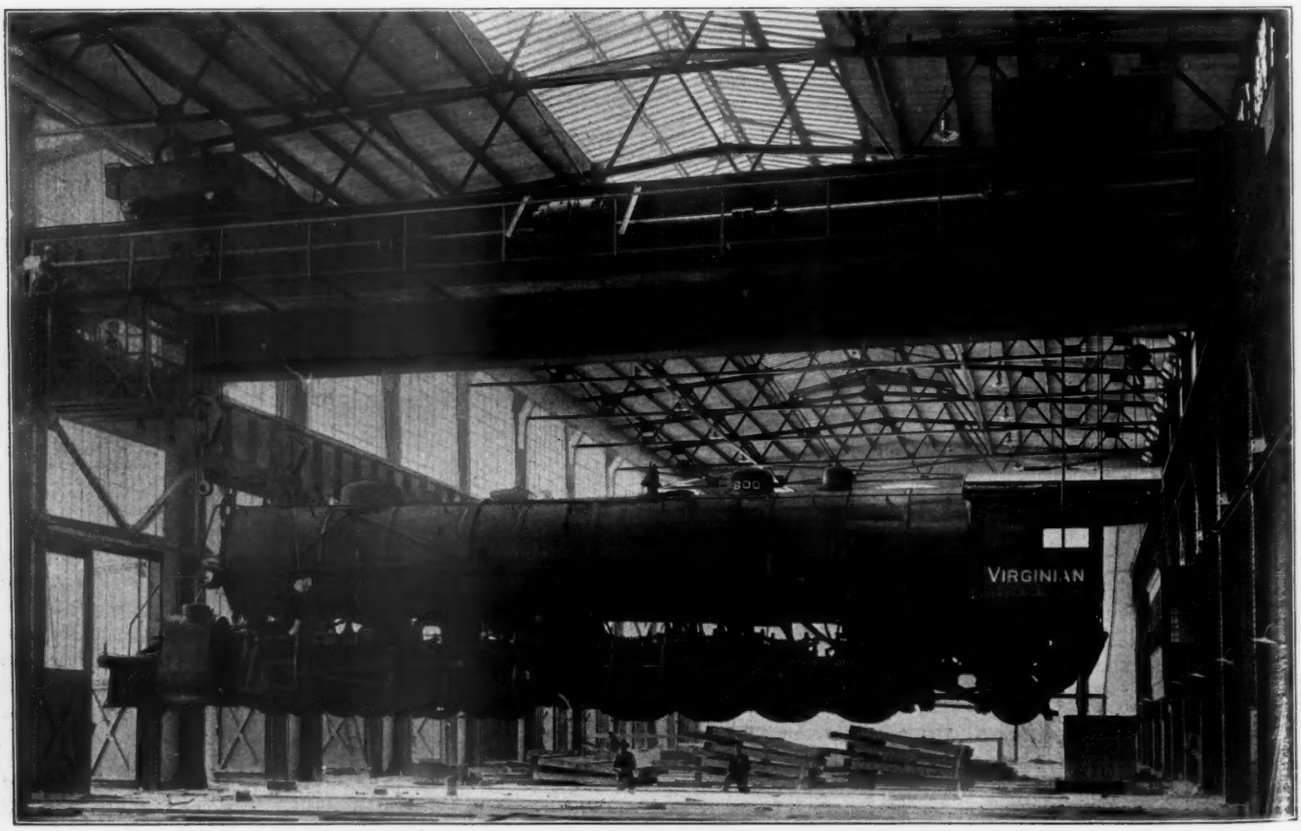
Motor and trailer trucks designed on this principle have been applied to some cars on the Metropolitan Railway of Paris, as well as on the London County Consul Tramway. While the general principles of the system are the same in all cases the constructional details vary greatly. No difficulty, however, is found in applying either the motors or the brake rigging, and the springs are arranged in practically the same manner as is used on a two wheel radial truck. The center pin is used as a common pivot pin for both the radial frames where possible, and the weight of the car body is usually transferred directly to the center of the main truck frame, which in turn is supported from the radial frames at six points.

REMOVING WHEELS FROM MALLETS

BY S. H. LEWIS,
Assistant Superintendent of Motive Power, Virginian Railway, Princeton, W. Va.

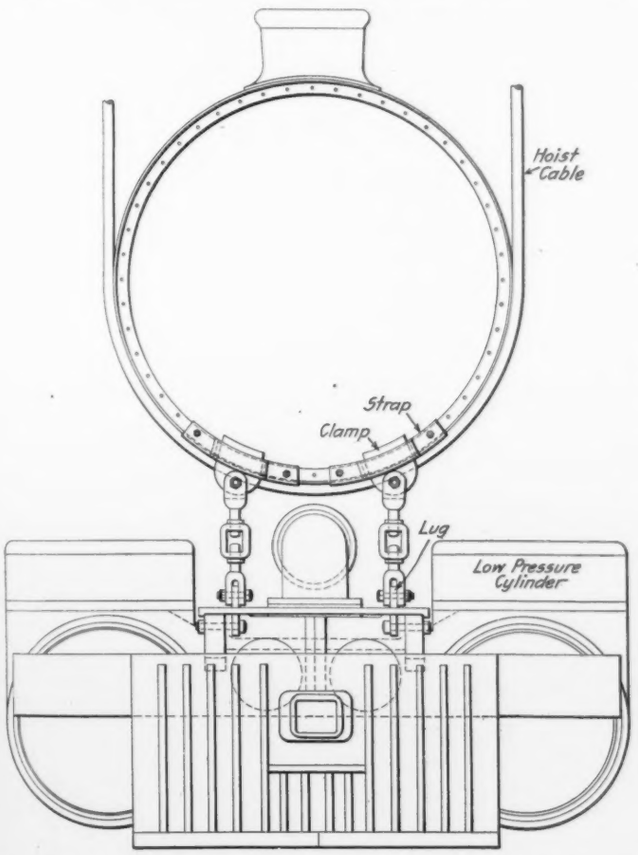
When a Mallet locomotive is brought to the shop it is customary to disconnect the low pressure unit, run it out from under the boiler and handle the two parts separately. This entails considerably more work than is necessary when a hoist of sufficient capacity to lift the whole locomotive is available. The necessary removal and replacement of a number of parts, some of which are quite troublesome to handle, is required, and furthermore, the low pressure engine frames and cylinders are awkward to transport and take up additional shop space.

At the Princeton, W. Va., shop of the Virginian Railway the erecting shop is served by a 200-ton traveling crane. This shop is of the transverse type and has a 75 ft. transfer table just outside the building. On the opposite side of the transfer table is a rod and wheel shop in which the engine trucks, rods, driving wheels and driving boxes are repaired. When a Mallet locomotive is brought to the shop for repairs it is disconnected from its tender and placed on the transfer table. When opposite the desired pit in the erecting shop it is drawn in by means of a snatch block and cable operated by the transfer table motor. Having a crane of the proper capacity to lift the whole locomotive, it becomes necessary to secure the low pressure unit to the boiler at its front end, and for this purpose



Mallet Locomotive Lifted by a 200-Ton Niles Crane; Virginian Railway.

the smokebox front is removed and triangular shaped pieces of steel are bolted to the low pressure extension frames by two of the frame bolts. These pieces remain on the locomotive permanently. Flat hooks are fastened to them and fit over the smokebox front ring. To prevent the hooks from slipping, they are held in place by curved straps bolted to the ring through the holes intended for the smokebox front bolts. With this arrangement the entire locomotive may be lifted, as shown in the photograph. The pedestal binders, main rods, brake rigging, etc., are removed or loosened and the locomotive is lifted by connections from the foot plate and from the front part of the smokebox. The engine truck is then run on the transfer table and the driving wheels with the side rods and driving boxes in place are pulled from under the locomotive to the transfer table by means of a cable operated by the transfer table motor. The boiler and frames are then lowered to temporary



Method of Fastening Low Pressure Cylinders to the Boiler of a Mallet Locomotive so That it can be Lifted by a Crane.

truck wheels which are stored at the back end of the pit and rolled under the locomotive after the driving wheels are removed.

After the wheels, rods, etc., are on the transfer table it is moved opposite the desired pit in the wheel shop, and these parts are drawn in by means of the cable and snatch block. Electric cranes are provided in the wheel shop for handling the different parts. The other parts of the locomotive are machined in the main machine shop, which is under the same roof as the erecting shop.

PASSENGER CAR VENTILATION IN GERMANY.—The rule as to windows in passenger cars in Germany has been that they must not be opened on both sides of the car without the consent of all occupying the compartment. Now on city and suburban trains in Berlin neither window in the front compartment of each car may be opened without unanimous consent.

MACHINE SHOP KINKS

BY SAMUEL MAGILL,
Apprentice Shop Instructor, Atchison, Topeka & Santa Fe., Topeka, Kan.

CHUCK FOR PLANING SIDE ROD KEYS.

A chuck whose bed is planed to the standard taper of the rod key is shown in Fig. 1. It is made 33¾ in. long x 16½ in. wide over-all, and will hold several keys rigidly while they are being

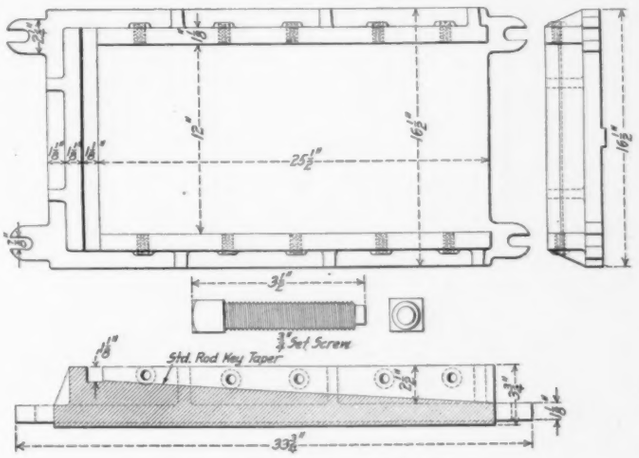


Fig. 1—Chuck for Rod Keys.

planed to the correct taper. A tongue on the bottom of the chuck fits in the slot in the table of the planer and lugs are provided at each corner for clamping.

JIG FOR ECCENTRIC BLADES.

The clamp shown in Fig. 2 is used when drilling and milling the jaws of an eccentric blade. It is made of block having a slot cut in the bottom to accommodate one side of the eccentric blade

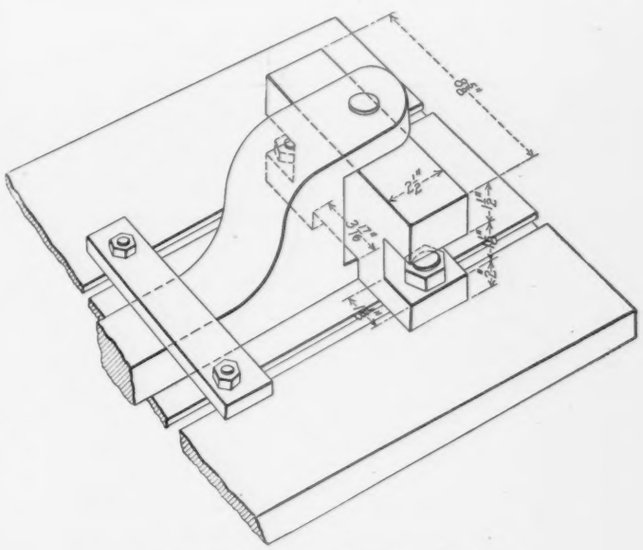


Fig. 2—Clamp for Eccentric Blade.

jaw and is clamped to the drill or milling machine, as shown in the illustration. It provides a rigid chuck and leaves the upper jaw free to be drilled or milled.

SLOTTING ECCENTRIC BLADES.

The tool shown in Fig. 3 is used for slotting out the jaws on eccentric blades. It is made to the special shape shown in the illustration, which has proved most satisfactory. A 1⅛ in. square

bar of tool steel is flattened out to a width of 3 in., and a thickness of 1 in. This tool is held in a tool holder 2¼ in. square by two ⅞ in. cap screws. This provides a rigid tool, with which

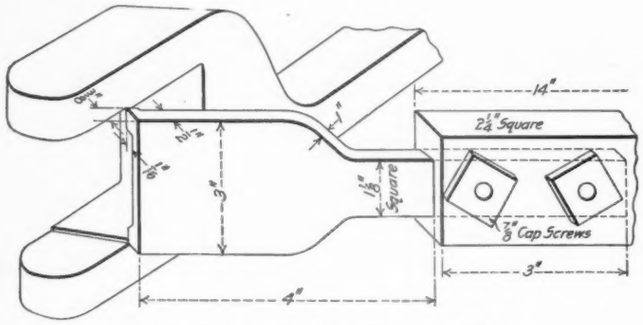


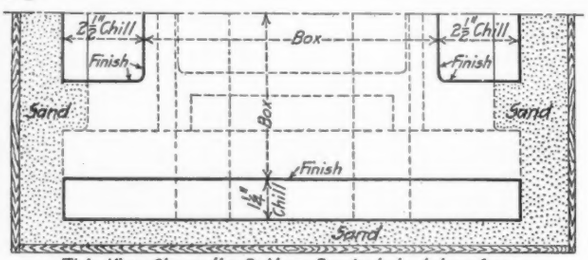
Fig. 3—Tool for Slotting Eccentric Blades.

an eccentric jaw can be slotted out in five minutes. The cutting tool is ground to the required width of the jaw and is so finished that both sides are slotted at the same time.

ENGINE TRUCK BOXES WITH CHILLED FACES

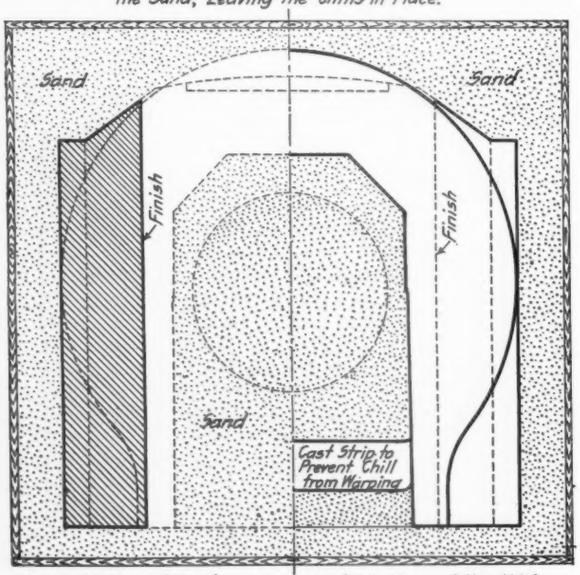
BY B. E. GREENWOOD,
General Foreman, Seaboard Air Line, Portsmouth, Va.

An engine truck box which when delivered from the foundry only requires the drilling of oil holes and of cellar bolt holes to be ready for service, has been in use on the Seaboard Air Line for two or three years with most satisfactory results. This box is cast with chilled surfaces on either face and in the shoe and wedge channels. The chills have smooth faces and the surface of the casting at these points is all that can be desired. The illustration shows the form and the location of the chills in the flask. A brass hub liner is used on the wheels in connection with these chilled boxes.

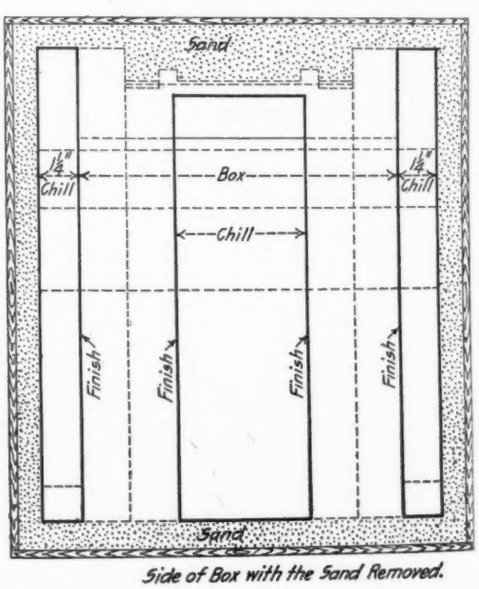


This View Shows the Pattern Ready to be taken from the Sand, Leaving the Chills in Place.

Note: The dotted lines represent the engine truck box. Full lines the chills.



Section at Center. Outside Face of the Chill.



Side of Box with the Sand Removed.

Arrangement and Form of Chills for Engine Truck Boxes.

SHOP ELECTRIFICATION

George W. Cravens, president of the Cravens Electric Company, Chicago, read a paper on "The Electrical Equipment of Railway Shops," before the September meeting of the Western Railway Club, of which the following is an abstract:

There are certain general laws which may be used as a guide in studying conditions and will help in formulating the preliminary layout of a shop. The best thing to do is to make a careful, comprehensive and detailed study of existing shops, old and new, especially those operating under conditions similar to the assumed conditions of the new one.

ELECTRICAL EQUIPMENT.

After having settled all of the preliminary questions, the next thing is to prepare a list of the lights, motors, etc., required for each department. The tools needed, consideration of group or individual drive, method of operation and control, kind and number of lights in shops and yards, miscellaneous applications of power, such as for heating, welding, etc., all must be taken into account. A preliminary power diagram should then be made up.

Having determined the machine tool layout and other factors effecting the amount and distribution of power the next thing to do is to make a complete wiring or power distribution diagram. After the general wiring diagram is finished the details of the power distribution in each building should be taken up separately and worked out in detail.

The best location for the power house is undoubtedly as near the center of the load of the plant as possible. This should include ultimate load, as well as present load, in so far as it can be determined. This is especially true of direct current plants on account of transmission losses, due to the general use of lower voltage than with alternating current. If the power is to be transmitted for any great distance the voltage should be as high as possible for safety in a shop.

Direct-current motors are usually designed for use on con-

stant potential circuits, three kinds being available for driving machine tools: series-wound, shunt-wound and compound-wound. Each of these has its field of usefulness, as well as its limitations. They are also made for use on the multiple-voltage system, but are not in very general use on account of the comparatively complicated controllers required. It is also necessary to use a motor large enough to deliver full load at the lowest voltage, which makes this system expensive to install.

Alternating current motors are also usually designed for use on constant voltage systems and are of two kinds, synchronous and asynchronous. That is, they are designed to run at a fixed speed in the first case or at varying speeds in the second case, the latter finding the widest application in machine shops. Motors of this kind may be obtained for operation on single-phase, two-phase or three-phase circuits, the single-phase and three-phase being the most used. For variable speed work the three-phase motor is better, the asynchronous or induction motor finding the widest application.

Reliable data as to the power required to drive the different classes of machines is very hard to obtain from outside your own shop, so that the best thing to do is to get a large motor and attach it to the machine in question and test it. Some time ago Prof. Flather conducted a series of tests to determine the power required to drive machine tools when cutting various metals, and he found that the results agreed very closely with the following formula:

$$HP = F \times D \times S \times C.$$

Wherein—
F = feed in inches,
D = depth of cut in inches,
S = cutting speed **in inches per minute,**
C = a constant whose value depends on the material worked.

If more than one tool is cutting at one time, the power required will increase in proportion to the number working:

The values of C are as follows:

Cast Iron	0.35 to 0.40
Soft Steel and Wrought Iron	0.45 to 0.50
Hard and Machinery Steel	0.70 to 0.80
Crucible Steel	1.00 to 1.10

Based upon the weight of metal removed in pounds per minute, the above formula can be changed to the following:

$$HP = F \times D \times S \times W \times K.$$

Wherein most of the symbols carry the same meanings as before, the others being W = weight per cubic inch of the metal being worked on and K = HP coefficient for that kind of metal, as given below:

Hard Steel	2.65 h. p.
Soft Steel and Wrought Iron	2.40 h. p.
Cast Iron, Hard	1.36 h. p.
Cast Iron, Soft	1.00 h. p.

The weights of the various metals as used in the above are as follows, in pounds per cubic inch:

Steel	0.284
Wrought Iron	0.278
Cast Iron	0.258

It will be noted that the figures given as the values for the constant K equal the actual horse power required at the motor for each pound of metal removed per minute, regardless of the rate of cutting.

It must not be thought that the cost of electric power for operating a shop will be the equivalent of the full load capacity of all the motors installed, for that is not the case. Figures based upon the records of nearly 200 shops which have come to my attention show the average load to be but 30 per cent. of the rated capacities of the motors installed.

At present there is a tendency towards increasing the number of machine tools per pit. The average is between 6 and 8 per pit with many shops having from 5 to 6, but the tendency is towards from 8 to 10 per pit in several recent shops. As to how many tools of each kind will be required there is no fixed rule, but a survey of the field shows the following proportions in existing shops:

PERCENTAGE OF TOOLS OF EACH TYPE PER ERECTING PIT.

Turning tools	50 per cent.
Cutting tools	25 per cent.
Drilling tools	11 per cent.
Grinding tools	7 per cent.
Miscellaneous	7 per cent.

A short time ago a table was published in one of the railway papers giving the number of machine tools total and of each class per erecting pit, and this showed the average to be slightly over 9 tools per pit. The table is as follows:

MACHINE TOOLS OF EACH CLASS PER PIT.

Lathes	3.925
Boring Mills	.875
Planers	1.00
Shapers	.5
Slotters	.458
Millers	.375
Drills	1.083
Grinders	.666
Miscellaneous	.708
Total	9.59

LIGHTING.

For the offices, drafting rooms and stations the indirect system of lighting is coming forward rapidly on account of its efficiency and very pleasing appearance as well as its freedom from glare. Carbon filament lamps stand the handling as drop and portable lights better than the Tungsten filament, although the new drawn wire type is much more rugged than those first made. Guards should be placed on all portables to protect them and to reduce the danger of fire.

For large areas, such as locomotive machine shops, foundries and yards, the flaming arc lamp is best suited because of its high power and great penetrative ability. Mercury vapor lamps are used to some extent in medium sized shops and power plants, and Tungsten lamps of various capacities, singly or in groups, are used to an increasing extent in machine shops, mills, power plants and many other places where there is no smoke to penetrate.

The best system of illumination for large shops is a combination of flaming arc lamps for general illumination with Tungsten clusters for group lighting and incandescent drop lights for machines. Good lighting consists in throwing the light on the work and not in the eyes of the worker.

MISCELLANEOUS SHOP KINKS

BY C. C. LEECH

CYLINDER PACKING RING FACING CHUCK.

The chuck shown in Fig. 1 is used for facing packing rings on a lathe. It consists of a mandrel *D* which is forced into a cast iron coupling *C*. A face plate *A* is held to this coupling by eight screws. The chuck jaws *B* slide in *T* slots in the face plate and are regulated by the conical bushing *E* which slides freely on the mandrel and is held in position by the nut *G*. The ends of the

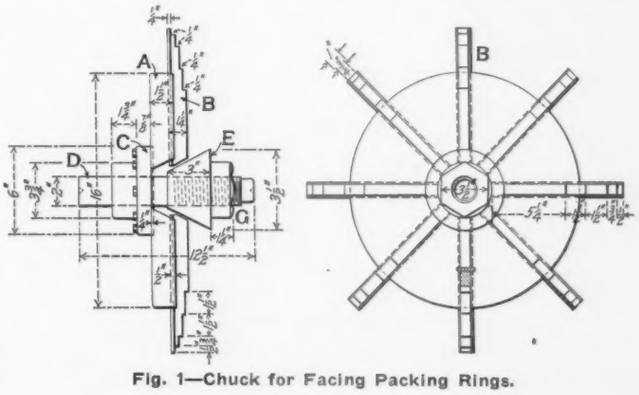


Fig. 1—Chuck for Facing Packing Rings.

jaws are planed to accurately fit the cone. To apply the packing ring withdraw the cone, slide the jaws inward and place the packing ring on the proper steps on the jaws. Then force the cone in against the ends of the jaws, causing them to move outward simultaneously and make a good even bearing on the inside of the packing ring. The mandrel *D* is fitted in the lathe centers

and is driven by an ordinary dog. This arrangement can be used in any lathe large enough to swing it.

PIPE RACK.

The pipe rack shown in Fig. 2 is made of ½ in. x 2 in. iron bars which are tied together with ¾ in. iron rods. This rack is handy for odd pieces of pipe, in that it has a floor of wood and

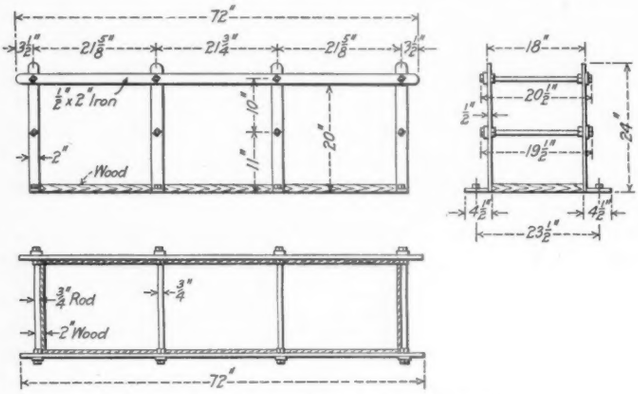


Fig. 2—Rack for Small Pieces of Pipe.

the ends are boxed in so that the pipe will not fall out. It should be located near the pipe machines and will prove convenient for the workmen.

TOOL FOR REPAIRING FIRE HOSE.

The device shown in Fig. 3 is used for applying brass ferrules to the inside of the ends of fire hose so as to make a tight joint with the coupling. It consists of a steel shaft *C*, which extends through a steel cylinder *D*. This shaft is threaded at one end and is shaped as shown. Keyways are provided at *E* in the portion

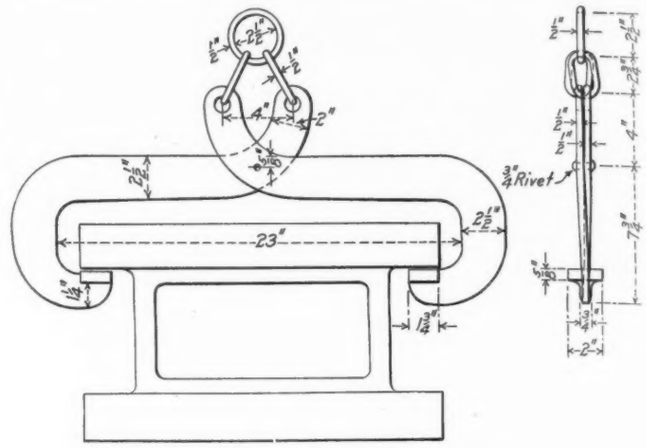


Fig. 4—Tongs for Lifting Driving Boxes.

tapered portion of the shaft, as shown in the general arrangement. As will be seen from the detail drawing of these segments, the inside surfaces are tapered to conform to the taper of the steel shaft. They are held in place about the shaft by rubber bands located in the grooves *M* and *N*. The whole arrangement is held by a clamp *P*, which may be bolted to a table or any convenient object. This clamp rigidly holds the steel cylinder *D*. Two brass bushings *R* and *S* are used on the barrel of the nut *F*,

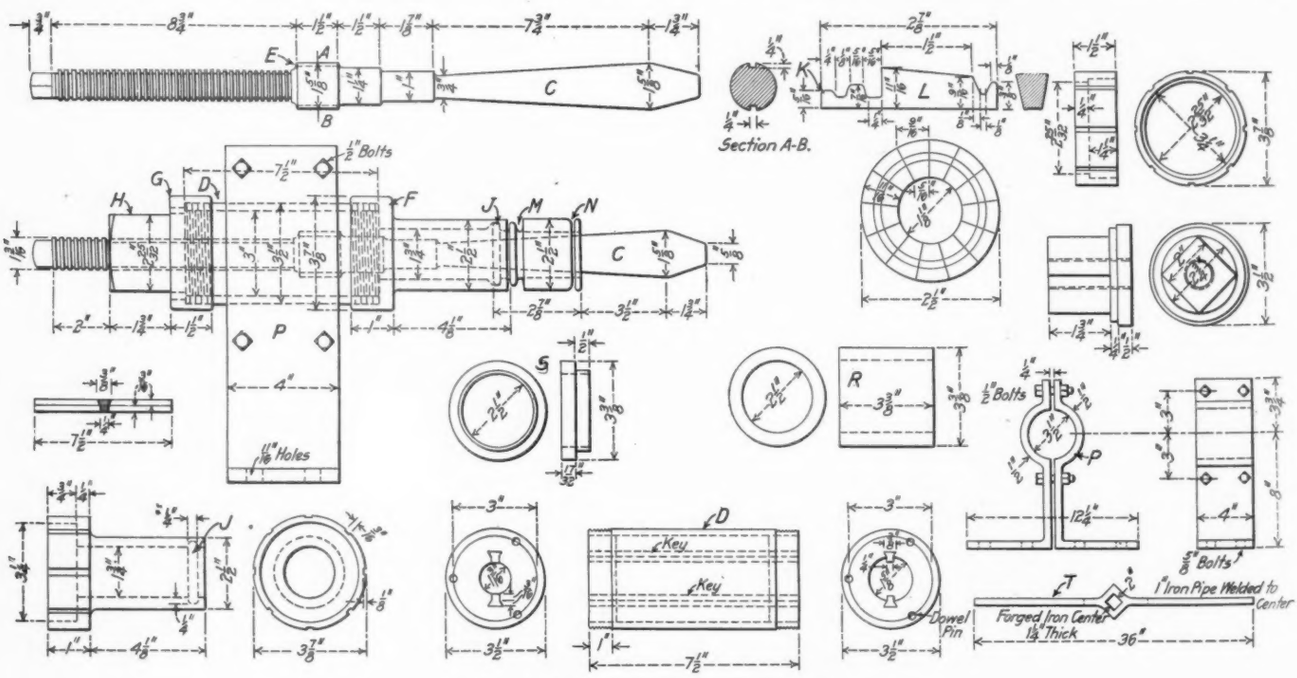


Fig. 3—Tool for Repairing Fire Hose.

which is 1⅝ in. in diameter. These keyways keep the shaft *C* from turning and slide freely on keys located in the steel cylinder *D*. This cylinder is ¼ in. thick and has two heads 1 in. thick forced in at either end, each being held by three dowel pins. A 1⅝ in. hole is bored in the right hand end and a 1 3/16 in. hole in the other end. The keyways are dovetailed in the heads as shown and run the full length of the cylinder, being parallel with the center line. The outside of the cylinder at both ends is according to which end of the hose is to be repaired. The bushings are first placed over the barrel and a very thin annealed copper ferrule is placed in the hose. It is then put on over the shaft with the ferrule coming directly over the brass segments and fitting against the bushing *R* or *S*, which in turn fits snugly against the head of the nut *F*. This ferrule is expanded into the hose by pulling the steel shaft through the brass segments by the nut *H* with the wrench *T*. This operation should be per-

formed two or three times, each time slightly turning the brass segments, so as to provide a smooth interior surface on the copper ferrule.

DRIVING BOX TONGS.

A pair of tongs used for lifting driving boxes is shown in Fig. 4. It consists of two arms made of 2½ in. x ½ in. bar iron bent to the shape shown and having a 2 in. bearing piece welded on the end of the hook. They are swung on a ¾ in. rivet and have links on the other end working in a ring.

TEMPORARY TELEPHONE POLE FOR WRECKING CREWS.

An important addition to the equipment of the wrecking train is a telephone apparatus which can be put in service anywhere along the line and allow the wrecking crew to communicate with the despatcher's office. It is not unusual to establish communication within four minutes after arrival at the scene of the wreck. The pole is joined together by the simple and effective method shown in Fig. 5. On the upper or top end of the last section the two wooden sticks *A* and *B* are fastened by means of the wing nuts *C* to a block that is securely fastened to the end of this section. These sticks have notches at their upper ends, as shown in the detail, in which are fastened two pieces of spring steel *I* and *E*. The straight spring has a roughened surface so as to form a better contact with the telephone wire. The brass liner *L* prevents undue wear on the wood as the pole swings on the wire after being hooked on. The copper wiring of the sticks is shown also in the details; from the brass posts *G* the two wires run down along the pole to the telephone box.

The sections of the pole are joined by brass bushings of tubing fastened securely to the ends as shown in Fig. 5, *H* and *J*. Each pair of joints that fit together are painted the same color so that the pole may be quickly put together. The parts are stored in a special box. As the bamboo is hollow a wooden plug several inches long is fitted into the end of the sections so as to form a good hold for the bushing which is fitted on over the outside of the pole and is held by a screw. A ¼ in. pin is placed on the inside of the bushing *J* and engages with the slot in the end of bushing *H* as the joints come together. When the bushing is pushed in all the way, it is given a little turn and the pin slides into the right angle part of the slot. At the same time the spring pin *M* in bushing *H* drops into the hole *N* in bushing *J* locking the parts together. The disjointing is accomplished by pressing down on the spring pin and turning the section enough to allow the pin to pass out of the slot.

The telephone box that goes with this outfit is shown in Fig. 6. It is made of wood and as light as possible so that it may be easily carried. Upon arrival at the wreck a man drilled in the handling of the apparatus takes the pole sections, joints them together, and going to the nearest telegraph pole reaches up and catches the telephone wires in the notched sticks at the end of the pole. Meanwhile another man has hung the telephone box at a convenient height on the telegraph pole, from a wire nail driven into it; the telephone wires are then connected at posts on top of the box and communication is established. This same outfit, but with a much smaller telephone box, is used by track supervisors to good advantage when the trackmen are at work at a part of the road remote from a station.

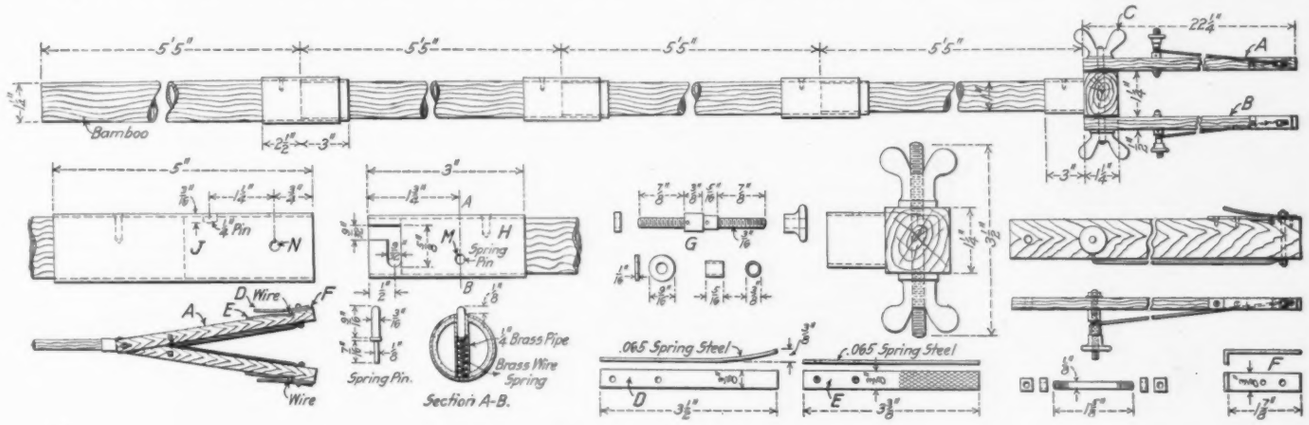


Fig. 5—Jointed Telephone Pole for Wrecking Crews.

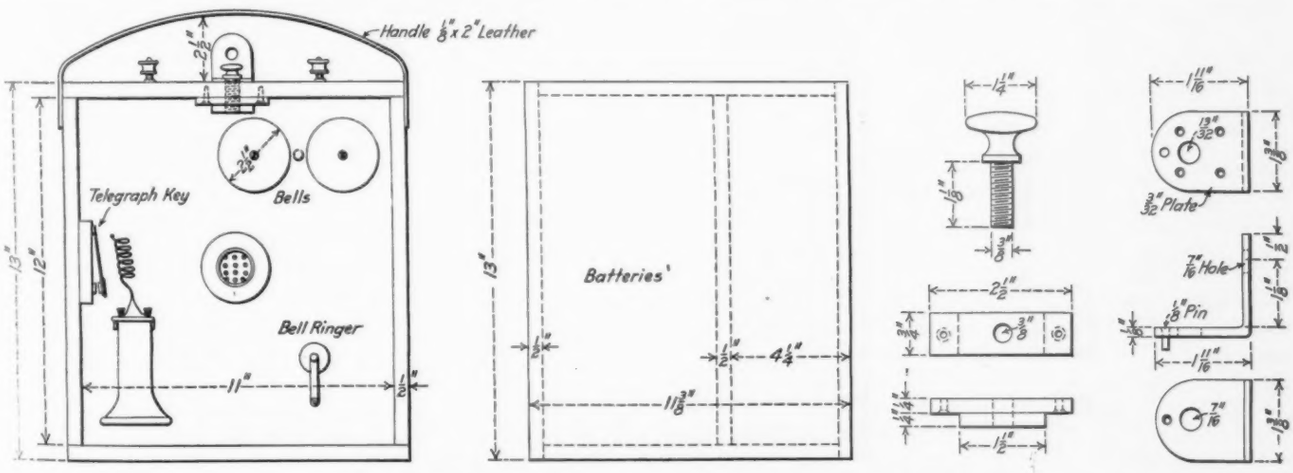


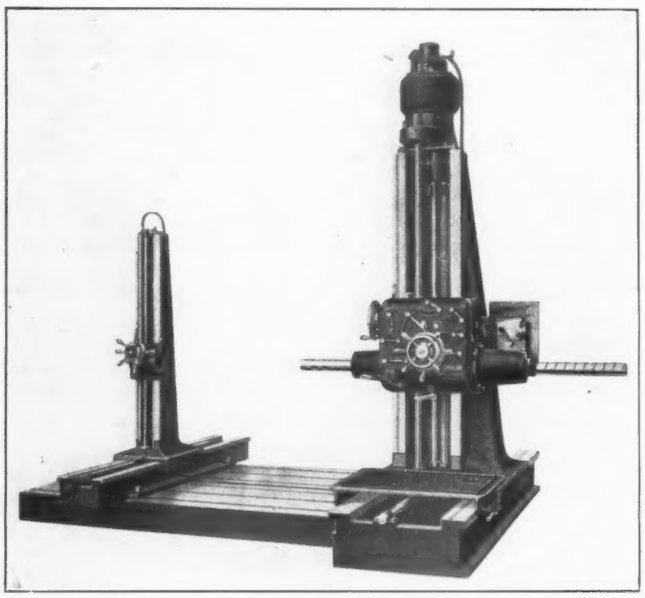
Fig. 6—Portable Telephone Box Used with Jointed Telephone Pole.

PULLMAN CARS.—The Pullman Company, according to its recent annual report, owns and controls 6,229 cars.

FLOOR TYPE BORING MACHINE

On page 376 of the July issue of this journal there appeared an illustrated description of a new horizontal boring machine designed by the Rochester Boring Machine Company, Rochester, N. Y. This machine is an excellent example of the latest development of this type of machine tool which has shown probably greater improvement in the last few years than any other tool for general use. The machine illustrated was of the table type and incorporated many new and novel features. The control was practically all centralized at the saddle and the automatic safety arrangements to prevent damage to the mechanism were most complete.

Practically the same machine is now being built in the floor type, as is shown in the accompanying illustration. It is suitable for boring, drilling, horizontal or vertical milling, tapping, splining, oil grooving or rotary planing, and is provided with power speed, feed and traverse in every direction, all of which are reversible. No two feeds or speeds can be engaged at the same time, nor can the power rapid traverse in different directions be thrown in until the feeds are disengaged. No two traverses can be engaged at the same time and limit stops are provided for every traverse in both directions.



Rochester Floor Type Horizontal Boring, Drilling and Milling Machine.

This machine has the same type of concentric screw feed that is used on the table type. This was illustrated by sectional views and was fully described on page 377 of the July issue. It employs a long bronze nut engaging a square screw thread on the spindle. The nut comes in contact with the side of the thread only and the end thrust in either direction is taken on ball bearings of large diameter. In this way a very long bearing is obtained and the wear is greatly reduced. The nut rotates at the same speed as the spindle when the feed is disengaged, but runs faster or slower than the spindle at a rate depending on the amount of feed desired when the gears are engaged. When the machine is used for milling the end thrust is taken on the saddle direct by a separate bronze thrust bearing.

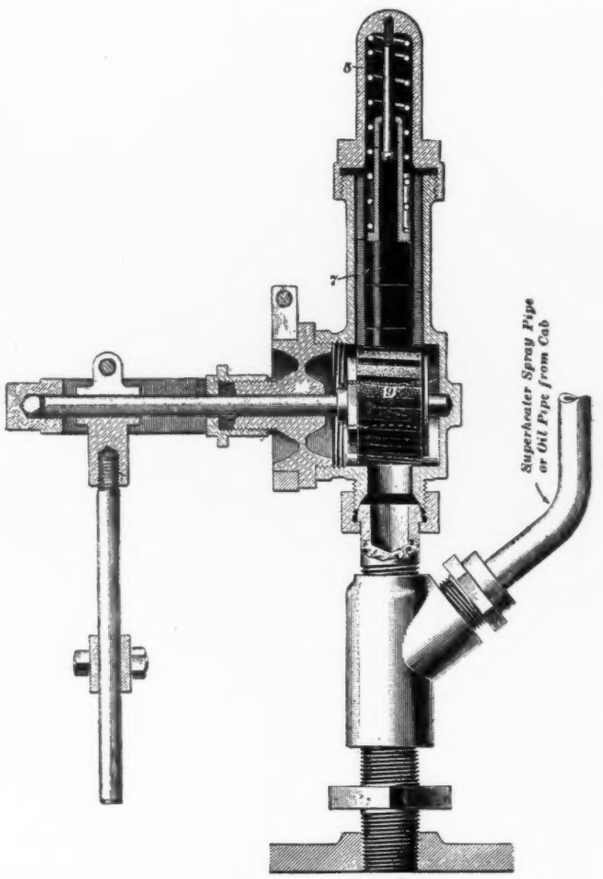
In the floor type machine the column is of very heavy construction with a long, wide base. It is side braced and designed to give the maximum rigidity in every direction. It is adjustable along the bed by hand or power, and reversible power feeds are provided for milling. Power rapid traverse brings it quickly to any desired position. The saddle is counterweighted and in addition to having the various levers for controlling the feeds, speeds and traverses, it carries the lever for starting, stopping and reversing the machine which is performed without stopping the main driving shaft.

When electric driven, the motor is mounted on top of the column as is shown in the illustration. This arrangement eliminates many gears and shafts, and gives a high efficiency of transmission, permitting the use of smaller motors. When belt driven the pulley is at the rear of the bed and drives the vertical shaft through beveled gears.

Friction clutches are used on the vertical high speed shaft and also for engaging power feeds, thus providing yielding points which prevent damage to the mechanism. All gears and moving parts are enclosed and fully protected. A self-oiling system supplies lubrication for the driving and feeding mechanism.

GRAPHITE LUBRICATOR

Graphite in either stick, powdered or flake form, depending on the character of the surface to be lubricated, has been successful as a lubricant for bearings and in some cases for cylinders exposed to a high temperature. Difficulty has been encountered when material of sufficient purity was not employed,



National Graphite Lubricator.

and also, when fed automatically, in keeping the supply continuous.

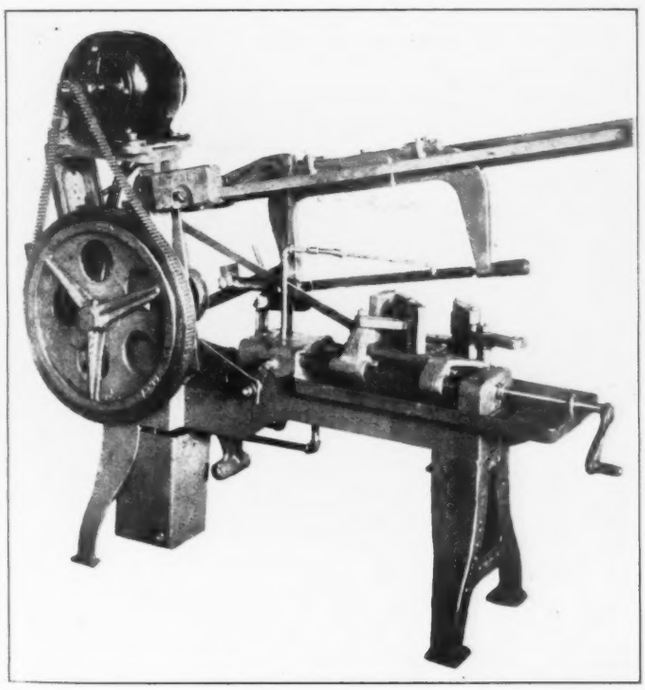
A lubricator for supplying graphite to locomotive cylinders and valves where it is to be used in connection with oil, is shown in the accompanying illustration. This device uses graphite in stick form, and is applied in a vertical position on the top of the steam chest, the graphite being discharged by gravity to the live steam chamber. The stick of graphite is held on top of a

toothed abrasive wheel by means of a spiral spring. This abrasive wheel is rotated through the medium of a connection to the valve stem or a similar moving part of the locomotive. The finely divided graphite is discharged to an opening just below the abrasive wheel and from here goes to the steam passage. A connection is arranged for the oil pipe from the cab just above the attachment to the steam chest so that the graphite powder mixes with the oil stream on its way to the valve chamber.

This lubricator is being tried experimentally on the Delaware & Lackawanna, and is reported to be entirely satisfactory on superheater locomotives. One stick of graphite, which is supplied in pieces one inch in diameter by one inch in length, will furnish lubrication, with the addition of a small quantity of oil from the hydrostatic lubricator in the cab, for a service of from 75 to 150 miles. This lubricator is furnished by the National Graphite Lubricator Company, Scranton, Pa.

HIGH SPEED HACK SAW

A power hack saw in which the length of the stroke is automatically regulated by the size of the stock in the vise is shown in the accompanying illustration. This machine is manufactured by E. C. Atkins & Co., Indianapolis, Ind., and it is stated that the gain due to the full stroke of the blade, automatically obtained, varies from 25 to 100 per cent. in time, and also results in a considerable saving in the number of blades used, as the wear on them is distributed over a greater area. The machine is arranged for slightly lifting the blade on the return



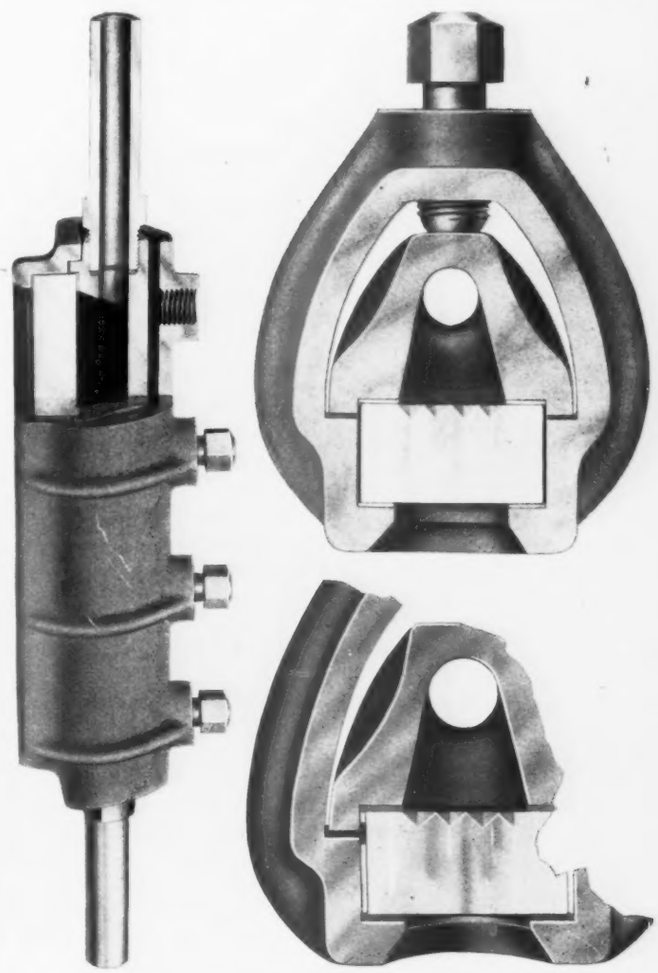
A High Speed Power Hack Saw.

stroke, the device for this purpose consisting of a friction grip working on a heavy upright bar adjusted by a counterbalance weight.

The details of the construction of the machine which is shown driven by a Crocker-Wheeler ½ h. p. direct current motor will be evident from the illustration. A complete lubricating system is provided. A swivel vise can be applied, if desired, permitting the cut to be made at any angle up to 45 degrees. An automatic stop is provided for stopping the cut at any desired depth. A controller attached to the motor bracket enables any speed being obtained from 50 to 100 strokes per minute.

WILTBONCO, W, WATER GAGE

Klinger type water gages have advantages, especially in connection with safety, which are causing them to be applied to locomotives in large numbers. It has been found, however, that the cost of maintenance of this type of water glass has been comparatively large, and, while it is not of sufficient importance to threaten their removal, it amounts to enough to make a study of methods of reducing it worth while. The Jerguson Manufacturing Company, 10 Post Office Square, Boston, Mass., has manufactured gages of this type from their introduction and has recently perfected a form of con-



Wiltbonco, W, Klinger Type Water Gage.

struction which, it is believed, overcomes many of the weak features of previous arrangements and will greatly reduce the maintenance cost. This gage is designated as style W, and consists of a brass body and a separate brass back piece, the latter including the steam and water cavity. The Klinger glass is held between these two parts, which are properly shaped to receive it and is gripped by means of pressure obtained by four set screws (five in the larger sizes), equally spaced on the back of the body. The general form and arrangement of this construction is clearly shown in the illustrations.

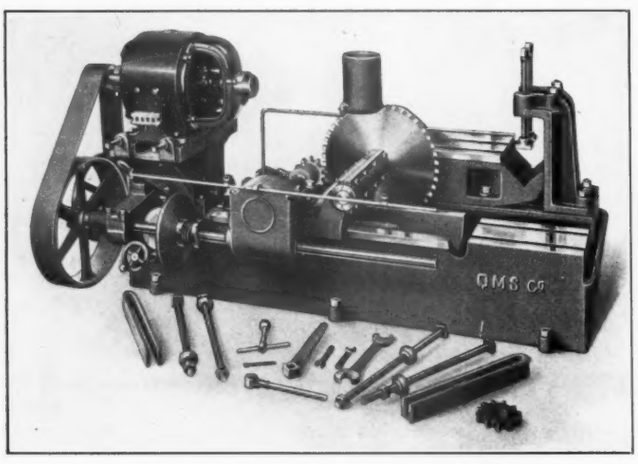
The chief source of expense on gages of this type has been the renewal of glasses, compelled either by leakage or breakage due to an uneven clamping action, and it is these two faults that the new design aims to overcome. It will be seen that three gaskets have been introduced between the steam space and the face of the glass. These are so arranged that it is necessary for the steam to work by each of them successively before a leak can develop. The two gaskets on the

front and back of the glass are of fibre, 1-32 in. thick, and the construction allows a liberal width of seat on the metal. The third gasket is between a lip on the back piece and the main body, and comes at the side of the glass about one-quarter of the distance from the back. This is a 1-16 in. gasket of elastic material and formed so as to seat against the glass, as well as between the lip on the back piece and the body. Its shape is clearly shown in one of the illustrations. The introduction of this gasket is one of the principal features of advantage of this new design. Its elasticity is such as to permit any unevenness in the thickness of the glass to be compensated and give an equal pressure on the fibre gaskets at the top and the bottom throughout the full length, while, at the same time, the elastic gasket will also be steam tight. The form of the back piece is one which gives great rigidity, and since it is held in place by four set screws, there is little probability of an unequal pressure being exerted at any point which will tend to put too great a strain on the glass.

Another feature that has received close attention in this design is weight. A No. 4 size weighs about 5 lbs., which is from 2½ to 4 lbs. less than previous designs of the same size. This feature is of considerable importance, especially where the gage is used to replace the ordinary water glass without renewing the fittings. In other particulars the new design is the same as previous Klinger type gages, in that the water shows black and steam white and that the connections are of the proper size and form to permit it to be applied in place of the ordinary round glass without any changes in the fittings.

COMBINATION SAW AND ROTARY PLANER

Among the improvements made on the Q M S saw and rotary planer are the belt-motor drive and improvements in the arbor bearings. The belt drive replaces a direct gear and pinion drive and gives a factor of safety if the saw should become stuck in the work. The arbor bearing is made in two sections so that any wear may be automatically taken up by tightening the sleeve surrounding the bushing. This machine is mounted on a circular base (not shown in the illustration) which revolves on



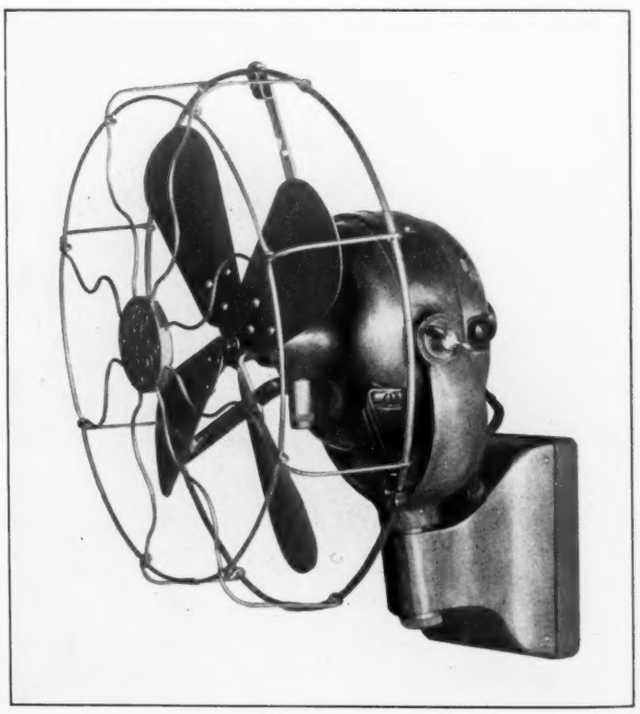
Combination Metal Saw and Rotary Planer.

roller bearings, and in this way allows the cutting of long pieces of material from any angle. The milling head is removed by loosening a few bolts and removing the split bearing. Both the milling head and saw blade have separate arbors, so that a change may be quickly made. The table has lateral adjustment, and when the milling head is not in use it is moved down so that the V-block which is a part of the table may be used for holding the work while it is being sawed, the clamps sliding in the T-slots of the bed. The motor is placed on adjustable slides to allow the tightening of the belt at all times.

The feed is of the adjustable variable friction type and can be changed from ¼ in. to 1 in. per minute. Both the milling cutter and the saw are driven by a sprocket wheel which has a forward adjustment to allow for 5 in. wear on the diameter of the saw blade. This sprocket drives a large gear on the periphery of the milling cutter and operates on the back of the teeth of the saw. The adjustable friction feed may be changed when the machine is in operation. The motion is transmitted to the feed screw through a clutch which may be disengaged, permitting adjustment of the carriage by hand. The machine is provided with an adjustable stop for the travel of the carriage. The Vulcan Engineering Sales Company, Chicago, are distributing agents for the Q M S products.

RAILWAY BRACKET FAN

A new bracket fan for railway car service has been designed by the General Electric company. The unique feature of the fan is a detachable baseplate, which allows it to be removed from the car interior at the approach of the winter season without removing any screws or marring the car finish. The plate remains permanently attached to the car, and when the fan is



Bracket Fan Used in Illinois Central Parlor Car.

taken down a neat cover finished in harmony with the car fittings is applied over the plate.

Either the fan motor base or the cover is readily mounted on the baseplate, without the use of tools of any description. Attaching these fixtures is accomplished by simply hooking the pins, with which the motor base and cover are provided, over the large screws on the baseplate. Spring contacts are provided on the face of the baseplate, which make contact with plates on the motor base, so that the fans are mounted and taken down without disturbing any wiring connections. The fan is arranged for both horizontal and vertical adjustment, and will remain in any position desired.

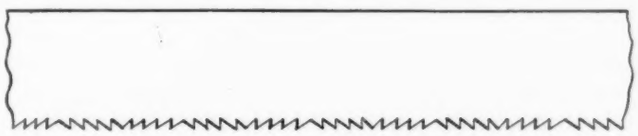
The motor is totally enclosed and dust proof. Standard fans are provided with single voltage, constant speed motors; but

motors wound for combination thirty and sixty volts can be furnished if desired. This is accomplished by opening and closing a single contact, which not only changes the motor winding but at the same time alters the value of the control resistance. The armature laminations and commutator are mounted on a separate brass sleeve and are pressed on the shaft, which is of large diameter, and can be removed without injury in case it is desired to make repairs to the armature. The field coils are held in place by steel pins and are removable. Large brushes are used and the brush holders may be readily taken out by loosening a screw. The bearings are of the self-alining type.

Easy accessibility to the commutator and motor interior is secured through the drop cover at the rear of the motor. The fan hub is fitted with oil slings, whereby all oil working out on the shaft is diverted back to the oil wells and prevented from creeping to the blades and being thrown over the car deck.

HACK SAW BLADE

A new design of hack saw blade has been invented by Alex. Reitlinger, of 201 William street, New York, which is arranged for cutting in both directions. The teeth are separated in groups of four, each adjacent group being formed to cut in the opposite direction. Comparative tests with this type of blade and several of the ordinary designs are said to have indicated that a saving of from 30 to 50 per cent. in time can be attained

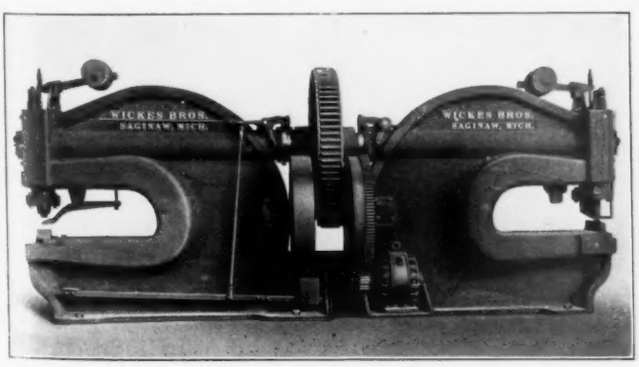


Hack Saw Blade for Cutting on Both Strokes.

with it when cutting by hand. Furthermore it is found that it gives a smoother and cleaner cut. When used on a machine which lifts on the return stroke, it is stated that it has a life equal to the ordinary saw in one direction and can then be reversed and will last as long again, thus giving the service of two blades of the customary arrangement.

MOTOR APPLICATION TO A PUNCH AND SHEAR

A remarkably well arranged motor application for a large punch and shear is shown in the accompanying illustration. This tool in the Saginaw, Mich., shops of the Pere Marquette, is a

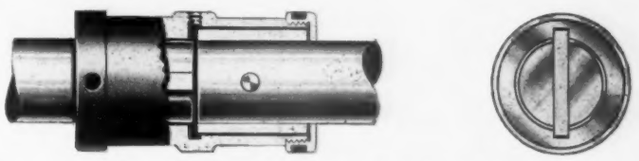


Well Arranged Motor Drive on a Large Punch and Shear.

powerful machine having a 42 in. throat opening at each end and a punching capacity of 1¼ in. diameter through 1½ in. of mild steel. The machine will shear a 2¼ in. square bar. The motor is located in a well protected position and occupies otherwise comparatively useless space. It is geared direct to the main shaft by simple reduction gearing, giving a minimum transmission loss. The motor used is a 10 horse power Westinghouse, operating on alternating current at 220 volts.

SHAFT COUPLING FOR MOTOR DRIVE

A flexible coupling made entirely of crucible cast steel has been designed by McEwen Brothers, Wellsville, N. Y. It was first used, and has proved successful, as a coupling between a steam turbine and a direct connected pump; in this service it ran twenty-four hours a day for several months without attention. It is particularly adapted also for the reversible motor drive on machine tools and for motor driven blowers, etc. The



Flexible Shaft Coupling for Motor Drive.

coupling is small and is arranged so that the keys pass through the shafts. The two keys are set at right angles and are arranged to permit the shafts to be considerably out of alinement. Because of the ample key bearing surface and good lubrication from the packing of heavy oil or soft grease, there is no noise or tendency toward serious wear.

SMOKE PROBLEM IN CHICAGO

In a paper presented before a recent meeting of the Western Society of Engineers, Chicago, Osborn Monnett, chief smoke inspector of Chicago, explained the method of inspection in that city.

It has been found that the more information the department can convey to the railroads the better the results. For instance, by giving the smoke densities for the various locations, a railroad may find that its per cent. density at a certain point is very satisfactory, whereas at another railroad center it is not at all satisfactory. By analyzing these smoke density reports for the various localities, a railroad is enabled to determine the points where its engines need special attention and to discover why it is that they cannot have a uniform smoke density throughout the city.

SMOKE STANDING OF THE VARIOUS RAILROADS IN THE SUMMER OF 1912.

	Railroad.	No. of Observations.	Engine Minutes.	Smoke Units.	Percent. Density.	Standing 1911.
1.	C. B. & Q.	329	1,089	191	3.51	1
2.	A. T. & S. Fe	66	122	28	4.75	8
3.	C. G. W.	40	75	21	5.6	3
4.	Illinois Central	409	919	321	6.98	11
5.	Michigan Central	45	98	43	8.98	15
6.	C. M. & St. P.	112	225	105	9.36	2
7.	N. Y. C. & St. L.	57	136	70	10.3	20
8.	B. & O. C. T.	58	126	67	10.63	7
9.	L. S. & M. S.	197	606	355	11.55	10
10.	C. & A.	74	191	111	11.62	25
11.	C. I. & L.	42	89	54	12.15	18
12.	C. & W. I.	36	74	45	12.16	21
13.	C. I. & S.	38	156	95	12.18	22
14.	C. & E. I.	136	420	262	12.47	24
15.	C. R. I. & P.	291	792	509	12.85	14
16.	C. & N. W.	580	1,384	898	12.94	5
17.	Grand Trunk	168	312	204	13.08	17
18.	Pere Marquette	17	44	29	13.18	12
19.	Pennsylvania	489	1,086	782	14.4	9
20.	Wabash	128	274	204	14.89	16
21.	C. R. & I.	24	84	63	15	28
22.	Belt Ry.	238	556	458	16.87	13
23.	Illinois Northern.	57	164	147	17.92	29
24.	Wisconsin Central	24	44	40	18.18	4
25.	B. & O.	85	217	227	20.92	6
26.	Mfgrs. Junction	8	13	14	21.54	Not Listed
27.	Erie	87	193	210	21.76	19
28.	Chicago Junction.	14	33	41	24.84	26
29.	E. J. & E.	38	180	282	31	30
30.	Unidentified	2	5	8	32	23
31.	Chi. Short Line	1	4	8	40	Not Listed
	Total	3,890	9,721	5,892	12.12	

GENERAL NEWS

In accordance with the new Arizona law requiring the use of high-power headlights on locomotives, the Atchison, Topeka & Santa Fe will have their locomotives equipped with electric headlights as fast as the manufacturers can supply them.

A department of safety has been established on the Vandalia, which will be composed of general and division committees, similar to those on many of the other roads. J. W. Coneys, division superintendent at Indianapolis, has been appointed chairman.

An announcement has been made by Professor Edward C. Schmidt of a gift of the University of Illinois by the Midvale Steel Company, of Philadelphia, of four axles and four pairs of supporting wheels for the new locomotive laboratory which is now under construction.

R. C. Richards, general claim agent of the Chicago & North Western, in a report of the first year's operation of the Safety Committee on that road, states that a decrease of 18 per cent. in personal injuries and deaths has been attained and that the money saving alone will amount to about half a million dollars.

Preparations are being made by the post office department to install pneumatic mail tubes between the Grand Central Terminal, New York, and the Pennsylvania Terminal. There will be two tubes approximately 1.3 miles long and 24 in. in diameter, and they will carry bags weighing 100 lbs. They will replace the mail wagons which run 20 hours a day, carrying a total of more than 4,000 bags of mail.

It has been announced that the Denver & Rio Grande will at once take steps to electrify important sections of their road. The first unit will be installed on the line from Helper, Utah, to Salt Lake City, a distance of 114 miles. The second unit will be over the Tennessee Pass, in Colorado, which runs from Salida, Col., to Minturn, a distance of 87 miles. The work is expected to begin the first of next year. Power will be obtained from hydro-electric plants located in the vicinity of these divisions.

The railroads running into Atlanta have a common agreement not to employ a person who has ever sued any of them, and under this they have blacklisted him and prevented him from getting work, asserts William M. Savage, a switchman, in a $10,000 damage suit filed in the superior court against the Seaboard Air Line. Savage states that he worked as a switchman for the Seaboard; and was injured in an accident, resigned and brought suit against the road. He won the suit and then applied to the Atlanta, Birmingham & Atlantic for a job as switchman. He obtained a temporary position with the A. B. & A., and that road wrote the Seaboard for recommendation, and the Seaboard, he alleges, made two false statements in reply. This letter and the agreement between the railroads, says Savage, caused him to be dismissed.—*Atlanta Constitution.*

SOUTHERN PACIFIC EMPLOYEES' CLUBS

The Southern Pacific and the allied lines of the Harriman group have for six years carried on a systematic, startlingly effective war against the saloon—the railroader's worst foe. Besides the strict enforcement of Rule G, prohibiting the use of intoxicants on or off duty, the companies have built sixteen club-houses for the employees at operating centers. Neat rooms, well-cooked, wholesome food of the best quality, non-intoxicating drinks, cigars, candy, and tobacco were provided for the men in these club-houses. Billiard and pool tables, bowling alleys, libraries, shower-baths, lounging places, halls for dances and meetings, were placed at their disposal. Almost from the beginning these club-houses became extremely popular, and proved to be powerful factors in enforcing Rule G, effective competitors of the saloon. In one small railway town of three thousand souls twenty-nine saloons flourished when the club-house was opened. Six months later half a dozen drinking places closed their doors. The others showed fight. Club-house employees were bribed to give poor service, cooks were induced to poison the men's food; as a last resort, the entire club-house crew was bought to go on strike. But the saloons lost. Two years after the opening of the club only seven of the original twenty-nine bars were left. Twenty-two closed for lack of patronage. At Tucson the floor of the club-house had to be relaid four times in six years. At Green River, a Wyoming division point so desolate and dreary that few workers remained after the first pay-day, the club-house lengthened the average term of service from less than thirty to more than ninety days. Everywhere the superintendents reported greater efficiency, sobriety, and self-respect among club-house patrons. Undoubtedly the clubs' influence upon the human factor assisted materially in bringing about the record of four years' safe travel, lately noticed in the newspapers. The victories won in the fight against the saloon by the institution have been permanent and progressive, thanks to the novel principles upon which the management of the club-houses is based. F. G. Athearn, the social engineer who founded the clubs, acted on the theory that institutions similar to the Young Men's Christian Associations would not reach the class of men he dealt with. Departing from the accepted standards of social welfare work, Mr. Athearn studied the methods of the enemy, the saloon, and adapted them to the railway's purposes. The saloon requires neither dues nor membership cards from its patrons. Neither do the railway clubs. They are open day and night to every employee who wishes to make use of their facilities. As in the saloon, all club patrons stand upon a plane of social equality—the same courtesy that greets the aristocratic engineer or conductor is extended to the humble section worker. Like the home and the saloon, the walls of the club-houses are innocent of signs prohibiting swearing, smoking, expectorating. There are no rules of conduct. The men's freedom of movement and action is as unrestricted as it is in the saloon. But the subtle influence of wholesome, neat environment has in no instance failed to prevent abuses. The men are expected to behave as gentlemen—and they do. They pay their way just as they do in the saloon, though no profit is derived from the operation of the club-houses except the indirect benefit resulting from cleaner, stronger, healthier manhood. This enterprise has vigorously suppressed every tinge of paternalism and patronage in order to lay hands upon that most elusive, unwilling individual, the adult, independent, self-respecting worker, and keep him out of the danger zone of the saloon.—*The Outlook.*

SAFETY "DON'T" BOOK.

The Pennsylvania Railroad has had printed for distribution among its employees, 50,000 copies of instructions for the guidance and protection of the employees. This publication takes the form of a "Don't" book and is printed in Italian and Polish, as well as in English. Some idea of the small details the Pennsylvania is watching can be seen from the contents of the "Don't" book. The following are a few of the "Dont's":

"Don't go under a train to make repairs or adjustments, until full protection has been secured.

"Don't place coal on tenders in such a manner that it may fall off.

"Don't think because a wire is dangling it is harmless. If necessary to remove it, use two sticks or boards.

"Don't wear gloves or loose clothes when working with machinery or tools.

"Don't use tools in bad order."

The Pennsylvania Railroad inaugurated its safety campaign a number of years ago, and only recently it received a medal for being the American employer to do most in 1911 for the protection of its employees.

MEETINGS AND CONVENTIONS

Western Railway Club.—At the monthly meeting held at the Auditorium Hotel, Chicago, on November 19, H. McL. Harding, of the Westinghouse Electric & Manufacturing Company, presented an illustrated paper on The Telpherage System as Applied to Shops and Terminals.

Central Railway Club.—John P. Kelly presented a paper at the November meeting on the subject of wheel sliding under heavy passenger equipment in which he mathematically and graphically illustrated the causes of sliding wheels. Special attention to brake designing that will take in consideration the effect on the equalizing springs of the truck was suggested.

American Institute of Mining Engineers.—An informal meeting of the Iron and Steel division of the American Institute of Mining Engineers was held in New York, November 7. Benjamin Talbot, of the Cargo Fleet Iron Works, Middleborough, England, described a new method of getting rid of piping and segregation in steel ingots by compressing the ingots after the outer portion has cooled and while the interior is still liquid.

M. M and M. C. B. Conventions.—At a joint meeting of the executive committee of the Master Car Builders' Association, American Railway Master Mechanics' Association and the Railway Supply Manufacturers' Association, held at the Hotel Belmont, New York, on Thursday, November 14, it was decided to hold the June convention at Atlantic City, N. J. The sessions of the Master Mechanics' Association will be held on June 11, 12 and 13, and those of the Master Car Builders' Association on June 16, 17 and 18, 1913. A strong effort was made to have the conventions at Washington, D. C., those favoring Atlantic City winning by the narrow margin of 12 to 10.

Western Canada Railway Club.—A. Hatton, superintendent of car service, Canadian Pacific, was the author of a paper on telephone train despatching, presented at the October meeting. The general principles of the apparatus and the advantages of its operation were briefly covered by the author. The discussion brought out the fact that an equipment of this character is very much more expensive than the telegraph, but it is believed that its advantages in operation fully off-set its greater cost. Reports from members who have had experience in the actual use of the telephone circuits were enthusiastic in its favor and indicated that the despatcher's work was reduced fully one half as compared with the use of the telegraph.

Meeting of Illinois Central Operating Officials.—The first annual meeting of the operating officers of the Illinois Central and Yazoo & Mississippi Valley was held at the Auditorium hotel in Chicago on October 7 and 8. W. L. Park, vice-president and general manager, presided. Reports were made on the following subjects: Co-operation; Undesirability of Criticising without Suggesting a Remedy; Always Safety First; Courtesy; Maintenance of Track and Structures; Maintenance of Automatic Track Signals by Track Foremen; Improvement in the Maintenance and Observation of Signals; How to Secure the Maximum Use of Freight Cars; Increased Tonnage per Locomotive Mile; Prevention of Loss and Damaged Freight; and a discussion of the reduction in the number of freight cars at terminals.

Railway Club of Pittsburgh.—A brief paper on the subject of electric welding, which was fully illustrated with lantern slides, giving views of work done on locomotives and machine tools, was presented at the September meeting by L. J. Hibbard, general manager, L. J. Hibbard Company, New York. The author said that there is nothing constructed of iron or steel, whether castings, forgings or rolled, regardless of size, that cannot be welded by the metal electrode. He also spoke of cutting with the electric arc, but the manner in which this is done was not explained. The discussion consisted largely of questions which brought out the fact that the success of the operation depends largely on the skill of the operator. Several members related successful experiences with electric welding on boilers, frames, cylinders and driving wheels.

Canadian Railway Club.—The value of the work of the car inspector was convincingly set forth by L. C. Ord, general car inspector of the Canadian Pacific, in a paper before the October meeting of this club. The things that a car inspector is required to watch, how he does it and the reason for the many rules by which he is governed were fully covered by the author. In the discussion, it was suggested that greater efforts should be made in connection with the education of car inspectors and of assisting them in their work. The importance of the "safety first" movement was strongly dwelt on by one speaker who stated that the car department was one of the most fruitful fields for activity in this direction. The use of surprise tests and the arranging of a more direct channel of communication between the operating officers and those in charge of car maintenance was suggested.

The following list gives names of secretaries, dates of next or regular meetings, and places of meeting of mechanical associations.

AIR BRAKE ASSOCIATION.—F. M. Nellis, 53 State St., Boston, Mass. Convention, May 6-9, 1913, St. Louis, Mo.

AMERICAN RAILWAY MASTER MECHANICS' ASSOC.—J. W. Taylor, Old Colony building, Chicago. Convention, June 11-13, 1913, Atlantic City, N. J.

AMERICAN RAILWAY TOOL FOREMEN'S ASSOCIATION.—A. R. Davis, Central of Georgia, Macon, Ga.

AMERICAN SOCIETY FOR TESTING MATERIALS.—Prof. E. Marburg, University of Pennsylvania, Philadelphia, Pa. Annual convention, June, 1913.

AMERICAN SOCIETY OF MECHANICAL ENGINEERS.—Calvin W. Rice, 29 W. Thirty-ninth St., New York. Annual meeting, December 3-6, Engineering Societies' Building, New York. Railroad session, Thursday morning, December 5.

CAR FOREMEN'S ASSOCIATION OF CHICAGO.—Aaron Kline, 841 North Fiftieth Court, Chicago; 2d Monday in month, Chicago.

INTERNATIONAL RAILWAY FUEL ASSOCIATION.—C. G. Hall, McCormick building, Chicago. Convention, May, 1913, Chicago.

INTERNATIONAL RAILWAY GENERAL FOREMEN'S ASSOCIATION.—William Hall, Chicago & North Western, Escanaba, Mich.

INTERNATIONAL RAILROAD MASTER BLACKSMITH'S ASSOCIATION.—A. L. Woodworth, Lima, Ohio. Convention, August 18, 1913, Richmond, Va.

MASTER BOILER MAKERS' ASSOCIATION.—Harry D. Vought, 95 Liberty St., New York. Convention, May 26-29, 1913, Chicago.

MASTER CAR BUILDERS' ASSOCIATION.—J. W. Taylor, Old Colony building, Chicago. Convention, June 16-18, 1913, Atlantic City, N. J.

MASTER CAR AND LOCOMOTIVE PAINTERS' ASSOC. OF U. S. AND CANADA.—A. P. Dane, B. & M., Reading, Mass. Convention, Sept. 9-12, 1913, Ottawa, Can.

RAILWAY STOREKEEPERS' ASSOCIATION.—J. P. Murphy, Box C, Collinwood, Ohio.

TRAVELING ENGINEERS' ASSOCIATION.—W. O. Thompson, N. Y. C. & H. R., East Buffalo, N. Y. Convention, August, 1913, Chicago.

RAILROAD CLUB MEETINGS

Club.	Next Meeting.	Title of Paper.	Author.	Secretary.	Address.
Canadian	Dec. 10	Tunneling	S. P. Brown	Jas. Powell	Room 13, Windsor Hotel, Montreal.
Central	Jan. 9	Loading and Unloading of Cars	Arthur Hale	H. D. Vought	95 Liberty St., New York.
New England	Dec. 20	Fire Protection	F. H. Wentworth	Geo. H. Frazier	10 Oliver Bldg., Boston, Mass.
New York	Dec. 20	Christmas Entertainment		H. D. Vought	95 Liberty St., New York.
Northern				C. L. Kennedy	401 Superior St., Duluth, Minn.
Pittsburgh	Dec. 19	Heat Treatment of Steel	A. F. Mitchell	J. B. Anderson	Union Station, Pittsburgh, Pa.
Richmond	Dec. 9	Baker Valve Gear	Ross Graham	F. O. Robinson	C. & O. Ry., Richmond, Va.
St. Louis	Dec. 13	Investments in General	H. L. Sittel	B. W. Frauenthal	Union Station, St. Louis, Mo.
Western	Dec. 17			Jos. W. Taylor	390 Old Colony Bldg., Chicago.

PERSONALS

It is our desire to make these columns cover as completely as possible all the changes that take place in the mechanical departments of the railways of this country, and we shall greatly appreciate any assistance that our readers may give us in helping to bring this about.

GENERAL.

J. A. Burke has been appointed fuel inspector of the Atchison, Topeka & Santa Fe, with headquarters at Clovis, N. M. His territory will be the Pecos division and that part of the Plains division south of Amarillo.

W. T. Davis has been appointed superintendent of air brakes of the Chicago & Alton, at Bloomington, Ill.

H. B. Macfarlane, engineer of tests of the Atchison, Topeka & Santa Fe, has had his office transferred from Topeka, Kan., to Chicago.

J. F. Sheahan has been appointed superintendent of motive power of the Atlanta, Birmingham & Atlantic, with headquarters at Fitzgerald, Ga., succeeding R. L. Doolittle, resigned.

H. Clewer, master mechanic of the Chicago, Rock Island & Gulf, with headquarters at Fort Worth, Tex., has been appointed superintendent of locomotive operation of the Rock Island Lines, with office at Chicago. He will superintend the work of the supervisors of locomotive operation, through the master mechanics, to effect further economies in the use of fuel, locomotive supplies, lubricating material, and in the operation of the locomotive. He will also render every assistance possible, through the various officers, to improve the maintenance, efficiency and operation of the locomotive by further instructive methods, in order that the cost of locomotive operation may be reduced and its efficiency improved. Mr. Clewer was born on March 30, 1869, at Jackson, Ohio. He began railway work May 20, 1888, as machinist helper for the Kansas City, Osceola & Southern, and was subsequently until June 24, 1894, a locomotive fireman and engineer on that road. He then went to the Chicago & Alton as a locomotive engineer, and was later road foreman of engines and master mechanic, resigning in May, 1902, to go to the Chicago, Rock Island & Pacific as a locomotive engineer. He served successively as roundhouse foreman, road foreman of engines and master mechanic until his recent appointment as superintendent of locomotive operation of the entire system.

H. Clewer.

MASTER MECHANICS AND ROAD FOREMEN OF ENGINES

H. P. Arnold has been appointed road foreman of equipment of the Louisiana division of the Chicago, Rock Island & Pacific, with headquarters at El Dorado, Ark., vice J. E. Mourne, transferred.

A. V. Birch has been appointed master mechanic of the Southern district of the Minneapolis, St. Paul & Sault Ste. Marie.

T. W. Callahan has been appointed master mechanic of the Missabe division of the Great Northern, with headquarters at Superior, Wis.

Clarence H. Chambers has been appointed road foreman of engines of the Atchison, Topeka & Santa Fe, with headquarters at Dodge City, Kan.

A. L. Fillmore has been appointed master mechanic of the Northern district of the Minneapolis, St. Paul & Sault Ste. Marie, with office at Stevens Point, Wis.

Hugh Gallagher, traveling engineer on the Illinois division of the Atchison, Topeka & Santa Fe, has been appointed master mechanic of the Arkansas River division, with headquarters at La Junta, Colo. He will also have charge of a portion of the Colorado division between La Junta and Canon City.

C. F. Gillaspy has been appointed traveling engineer of the Northern district of the Minneapolis, St. Paul & Sault Ste. Marie.

Bristol F. Gram has been appointed traveling engineer of the Minneapolis, St. Paul & Sault Ste. Marie, with headquarters at Glenwood, Minn.

W. W. Hamilton has been appointed road foreman of engines of the Missouri division of the Atchison, Topeka & Santa Fe, with headquarters at Shopton, Iowa, vice D. Leary, assigned to other duties.

E. C. Hanse, general foreman of the Georgia & Florida at Douglas, Ga., has been appointed acting master mechanic, with headquarters at Douglas, succeeding J. F. Sheahan, master mechanic, resigned to accept service with another company.

John W. Hendry has been appointed assistant master mechanic of the Minneapolis, St. Paul & Sault Ste. Marie, with headquarters at Thief River Falls, Minn.

L. Leysaht, general foreman of the St. Louis roundhouse of the St. Louis & San Francisco, has been appointed master mechanic in the Brownsville territory, with headquarters at Kingsville, Tex.

W. J. McLean, who was appointed master mechanic of the Duluth, Rainy Lake & Winnipeg, a subsidiary of the Canadian Northern, in May, has been appointed master mechanic also of the Duluth, Winnipeg & Pacific, with headquarters at the West Duluth, Minn., shops.

George F. Majors has been appointed road foreman of equipment of the Illinois division of the Chicago, Rock Island & Pacific, with headquarters at Rock Island, Ill., and jurisdiction over Tri-Cities Terminal, Peoria and Bureau Lines.

A. L. Moler has been appointed master mechanic of the Charlotte Harbor & Northern, in charge of motive power and equipment, with office at Arcadia, Fla., succeeding H. D. Jackson, resigned on account of ill health.

J. E. Mourne has been appointed road foreman of equipment of the Chicago, Rock Island & Pacific, with headquarters at Trenton, Mo., having jurisdiction over the Missouri division territory west of Trenton.

Edward Norton has been appointed master mechanic of the Atchison, Topeka & Santa Fe, with headquarters at Dodge City, Kan.

Nels Osgard has been appointed master mechanic of the Superior division of the Great Northern, with headquarters at Superior, Wis.

W. C. Sealey, general foreman of the Grand Trunk at the Toronto, Ont., shops, has been appointed assistant master mechanic of the middle and southern division, with office at Toronto. G. M. Wilson succeeds Mr. Sealey.

GEORGE D. SIEMANTEL has been appointed master mechanic of the St. Louis, Rocky Mountain & Pacific, with headquarters at Cimarron, N. M. Mr. Siemantel will have charge of both the mechanical and stores departments.

CAR DEPARTMENT

P. ALQUIST has been appointed general inspector of the car department of the Pere Marquette at Grand Rapids, Mich., vice W. H. Rourk, resigned.

GEORGE GLADSON has been appointed assistant car foreman of the St. Louis & San Francisco at Francis, Okla.

E. W. HARTOUGH has been appointed assistant chief car inspector of the Pere Marquette, with headquarters at Grand Rapids, Mich.

G. W. MOORE has been appointed general foreman of the car department of the St. Louis & San Francisco, at Kansas City, Mo., vice G. A. Robinson, resigned.

T. M. RAMSDELL, master car builder of the Chesapeake & Ohio, has been appointed master car builder of the Chicago & Alton, with office at Bloomington, Ill.

C. F. WHITNEY, general foreman of the car department of the St. Louis & San Francisco, at Chaffee, Mo., has been transferred to Memphis, Tenn.

SHOP AND ENGINE HOUSE

MARTIN DELACY has been appointed assistant night roundhouse foreman of the Chicago & North Western, with headquarters at East Clinton, Ill.

D. L. DELMIDA has been appointed foreman of the south section of the roundhouse of the Illinois Central at Springfield, Ill.

I. H. DRAKE has been appointed general foreman of the Atchison, Topeka & Santa Fe, with headquarters at Raton, N. M.

F. G. FISHER, roundhouse foreman of the St. Louis & San Francisco, has been appointed temporary general foreman, at Chaffee, Mo., vice A. McCormick, resigned.

RANCE JOHNSON, boiler foreman of the Atchison, Topeka & Santa Fe, at La Junta, Colo., has been transferred to Dodge City, Kan.

W. D. JOHNSTON has been appointed foreman of the locomotive department of the Chicago, Rock Island & Pacific, with headquarters at Valley Junction, Iowa, vice J. H. Wills, resigned.

W. H. MCDONALD has been appointed assistant roundhouse foreman of the Atchison, Topeka & Santa Fe, with headquarters at Clovis, N. M.

THOS. E. MCQUADE has been appointed night roundhouse foreman of the Chicago, Rock Island & Pacific, with headquarters at Peoria, Ill., vice Lee Munger, resigned.

W. R. MABILE has been appointed roundhouse foreman of the Chicago, Rock Island & Pacific, with headquarters at Winnfield, La., vice H. P. Arnold, transferred.

G. MIHLEISEN, assistant general boiler inspector of the Coast Lines of the Atchison, Topeka & Santa Fe, has been appointed boiler foreman, with headquarters at La Junta, Colo., vice Rance Johnson, transferred.

F. C. MOELLER has been appointed night roundhouse foreman of the Chicago, Rock Island & Pacific, with headquarters at Burr Oak, Ill., vice W. O. Morton, promoted.

J. C. SATTERLEE has been appointed roundhouse foreman of the St. Louis & San Francisco, with headquarters at Birmingham, Ala., vice James Galtney, resigned.

WILLIAM T. STEVENSON, roundhouse foreman of the Atchison, Topeka & Santa Fe, at Cleburne, Tex., has been appointed general foreman, with headquarters at La Junta, Colo., vice E. J. McMahn, resigned.

T. L. WALTERS, roundhouse foreman of the Atlanta, Birmingham & Atlantic, at Fitzgerald, Ga., has been appointed roundhouse foreman of the Central of Georgia, with headquarters at Macon, Ga.

ELMER WARING, day engine inspector of the Atchison, Topeka & Santa Fe, at Waynoka, Okla., has been appointed night roundhouse foreman, vice George Cummings, resigned.

PURCHASING AND STOREKEEPING

CLINTON D. BALDWIN has been appointed purchasing agent of the Bangor & Aroostook, with office at Milo Junction, Maine.

H. C. MACKLIN, purchasing agent of the Seaboard Air Line at Portsmouth, Va., will also have jurisdiction over the Tampa Northern.

J. R. MULROY, general storekeeper of the St. Louis & San Francisco, at Springfield, Mo., has been appointed general storekeeper of the Pullman Company, with office at Pullman, Ill.

A. H. YOUNG, traveling storekeeper of the St. Louis & San Francisco, has been appointed general storekeeper, with headquarters at Springfield, Mo., to succeed J. R. Mulroy, resigned.

OBITUARY

REUBEN WELLS, who was a railway mechanical officer, well known to the last generation, died at his home in Paterson, N. J., on November 8, at the age of nearly 83 years. He was born in Chester county, Pennsylvania, on January 1, 1829, and was a farmer boy until he was 17 years old. He then became a machinist apprentice on the Reading Railroad. From there he went to Shelbyville, Ind., as master mechanic of several roads, which were afterwards consolidated under the name of the Jeffersonville, Madison & Indianapolis, now a part of the Pennsylvania. It was while here, in 1868, that he designed and built one of the heaviest locomotives of its day for operating on the Madison incline. It attracted a great deal of attention at the time, and a report of it and its performances appeared in the proceedings of the Master Mechanics' Association for 1871. The diverse duties of the master mechanic at that time may be realized by the following instance. In the summer of 1863 two army corps from the army of the Potomac had to be moved to Nashville, Tenn., as quickly as possible and with no more public notice than was necessary. The army officer in charge of transportation arrived at Indianapolis only a few hours before the first company of the troops, and as both the president and the superintendent of the road were out of reach, Mr. Wells was for six days in entire charge of the road, operating it exclusively for the transportation of the troops from Indianapolis to Louisville. During this week, therefore, he acted as superintendent, master mechanic, yard master and even train despatcher. He was with the

Reuben Wells.

J. M. & I. for 25 years, during five years of which he was a trustee of Purdue University. In 1878 he went to the Louisville & Nashville as superintendent of machinery. He was appointed general manager in 1884, and the next year was made assistant to the president. In 1887 he left the Louisville & Nashville to become superintendent of the Rogers Locomotive Works, at Paterson. He was made manager of the works in 1900, and retained this position after the absorption of the Rogers Works in the American Locomotive Company. He resigned in April, 1907. From the date of its formation, and during the whole period of his active life, he was a prominent member of the American Railway Master Mechanics' Association, serving that organization as president from 1882 to 1884, and exerting an important influence on the actions of the society, in whose discussions he took great interest.

M. A. Malloy, master mechanic at the South Pittsburgh, Pa., shops of the Pennsylvania Railroad, died on November 3, at Pittsburgh. He was born at Salem, W. Va., on September 30, 1855, and was educated in the public schools. After completing his apprenticeship in a machine shop at Hollidaysburg, Pa., he entered the service of the Pennsylvania Railroad on April 14, 1879, as a machinist at the Altoona machine shops, and in April, 1881, was made inspector. In October, 1883, he was promoted to a gang leader, and in 1894 was made foreman. On January 15, 1902, he was made assistant master mechanic at the South Pittsburgh shops of the same road, and one year later he was promoted to master mechanic at the South Pittsburgh shops, which position he held to the time of his death.

M. A. Malloy.

Howard James, director of purchases of the Great Northern Railway and vice-president and general manager of the Great Northern Steamship Company and president of the Northern Steamship Company, and S. B. Plechner, purchasing agent of the Great Northern Railway, were killed on November 24, when the automobile in which they were driving upset near "North Oaks," the country home of James J. Hill, located about eight miles north of St. Paul, Minn. Mr. James was born August 12, 1862, and began railway work in December, 1882, as clerk in the general freight department of the St. Paul, Minneapolis & Manitoba. From 1886 to 1888, he was secretary to the general manager of that road and was then for one year treasurer and purchasing agent of the Eastern Railway of Minnesota. In September, 1889, he became superintendent of the Northern division of the St. Paul, Minneapolis & Manitoba and the Great Northern at Barnesville, Minn., and from 1892 to September, 1895, superintendent of the Minneapolis Union. He was then made purchasing agent of the Northern Steamship Company, and in August, 1899, purchasing agent of the Great Northern Railway. Mr. James became director of purchases of the Great Northern Railway, vice-president and general manager of the Great Northern Steamship Company and president of the Northern Steamship Company, in September, 1905. Mr. Plechner also had been with the Great Northern Railway for a number of years.

New Shops

Atchison, Topeka & Santa Fe.—The engine house and machine shops at Long View, Tex., were destroyed by fire on October 25.

Boston & Maine.—Plans have been prepared for building frog shops at Nashua, N. H. The list of tools for the new Billerica shops near Lowell, Mass., will be made public in the near future. The shops are planned for repairing 30 locomotives, 200 passenger cars and 1,000 freight cars a month. B. S. Hinckley is the purchasing agent, and is located at Boston.

Canadian Pacific.—It is reported that this road will erect car shops at Toronto at an approximate cost of $500,000. It is reported that this road will also build large car shops at Moose Jaw, Sask.

Canadian Northern.—Bids will soon be called for for the building of a blacksmith shop and engine house at Port Mann, B. C.

Chesapeake & Ohio.—Improvements will be made at Russell, Ky., on the engine house and shops. Expenditures will amount to approximately $1,000,000.

Chicago, Milwaukee & St. Paul.—A new engine house will be built at Austin, Minn., and the shops will be electrified.

Cleveland, Cincinnati, Chicago & St. Louis.—The work of building the new engine house at Cairo, Ill., will soon be begun and the plans for the electrification of the yards, engine house and machine shops at Hillsboro, Ill., have been completed.

Louisville & Nashville.—It is reported that this company will build car shops at Irvine, Ky. An extension of the line is now being made from Winchester, Ky., to Irvine.

Missouri & North Arkansas.—A contract has been made by the directors and receivers of this road for new shops at Harrison, Ark. It is reported that $125,000 has been appropriated for this work.

Michigan Central.—It is reported that a machine shop will be erected at Jackson, Mich.

Missouri Pacific.—A new 12-stall engine house, blacksmith shop, boiler shop, oil house and other improvements will be erected at Atchison, Kan., at an approximate cost of $35,000.

New York, New Haven & Hartford.—Contracts have been awarded for a repair shop at Maybrook, Conn.

Pennsylvania.—A new engine house will be built at Altoona, Pa., which will contain 40 stalls. A machine and blacksmith shop will also be built and equipped with an electric traveling crane. A mechanically operated coaling station will be erected with two 50,000 gallon water tanks. Smaller buildings will be included in the general plans and the structures will be made of steel and concrete. Plans have been prepared for the addition of nine new stalls to the engine house at Morrisville, Pa. A new blacksmith and machine shop will also be built. The construction of a large engine house at East St. Louis, Mo., has been started. There items are not confirmed.

Queen & Crescent.—The work of improving the shops and engine house at Ludlow, Ky., will be commenced in the near future.

Southern Pacific.—Plans have been made for an increase in the capacity of the Sparks, Nev., shops.

Pullman Passengers.—During the last fiscal year, 24,256,000 passengers rode in Pullman cars. This is an increase of 4.6 per cent. over the previous year.

SUPPLY TRADE NOTES

The Alexander Milburn Company, Baltimore, Md., has just moved to its new premises, 1420 West Baltimore street.

Edwin Strassburger has been made vice-president of the Buffalo Brake Beam Company, New York, with office in St. Louis, Mo.

Charles H. Burt has been made general sales manager of the Robinson Coupler Company, Washington, D. C., with office in that city.

C. R. Jamison has resigned as sales manager of the Acme Supply Company, Chicago, to engage in business on his own account at Danville, Va.

The Industrial Car Company, Cleveland, Ohio, manufacturers of electric cars and locomotives, has changed its name to the Electric Locomotive & Car Company.

The S. Jarvis-Adams Company has changed its name to the Pittsburgh Iron & Steel Foundries Company, with general offices at its works at Midland, Pa.

A. Lichtenhein, Canadian representative of the Galena-Signal Oil Company, Franklin, Pa., with office in New York, died at his home in New Rochelle, N. Y., on October 31.

The erecting plant of the American Car & Foundry Company at Terre Haute, Ind., was destroyed by fire on November 18. The loss is estimated at between $75,000 and $100,000.

The Rumsey Car Door & Equipment Company, Chicago, has been incorporated by J. W. Rumsey, Oscar Hogin and W. H. Sheasby. The company will manufacture car doors and railway equipment.

The Chicago Bearing Metal Company, of Chicago, has purchased 8.44 acres on the north side of West Forty-third street near Western avenue, Chicago, on which to erect a new $200,000 fireproof plant.

The sales of the Westinghouse Air Brake Company, Pittsburgh, Pa., during August and September, the first two months of the fiscal year, exceeded those in the corresponding period of last year by 75 per cent.

The Alexander Milburn Company, Baltimore, Md., maker of various kinds of acetylene apparatus, has moved its general offices from 505-7 West Lombard street, to larger quarters at 1420-6 West Baltimore street.

E. W. Strong, formerly in the publicity department of the American Locomotive Company, New York, has been appointed manager of the publicity department for the American Vanadium Company and the Vanadium Sales Company, Pittsburgh, Pa.

Walter A. Johnson has been appointed manager of the Atlanta, Ga., office of the Independent Pneumatic Tool Company, Chicago, succeeding John J. Keefe, deceased. Mr. Johnson has been connected with this company at its Pittsburgh office.

H. J. Downes has been appointed to the vacancy in the publicity department of the American Locomotive Company, New York, made by E. W. Strong's resignation. Mr. Downes has been with the American Locomotive Company for a number of years in the engineering department.

Charles L. Wright, chief of the briquetting division of the Government Bureau of Mines, has gone to the Roberts & Schaefer Company, Chicago, to take charge of its coal briquetting department. This company has acquired an operating plant where it is prepared to make briquetting tests for prospective clients.

Fred Lavis, 281 Reconquista, Buenos Aires, Argentina, who has charge of railway construction for the Argentine Railway Company, desires to obtain copies of catalogs issued by manufacturers of railway supplies, tools, machinery and various railway materials, including engineering supplies and drawing material.

William Marshall, president of the Anglo-American Varnish Company, of Newark, N. J., died at his home in Asbury Park, November 30, from heart disease. Mr. Marshall was very popular throughout the paint field, and will be especially missed by the members of the railway masters painters' associations. He was 64 years old.

Walter Rachals has gone with Westinghouse, Church, Kerr & Company, Pittsburgh, Pa., in their iron and steel works department. Mr. Rachals has been connected with the iron and steel business in the United States since 1895, and was chief engineer of the National Steel Company until this concern was consolidated with the Carnegie Steel Company.

John J. Keefe, southern representative of the Independent Pneumatic Tool Company, at Atlanta, Ga., died November 20, from an attack of typhoid fever. Mr. Keefe was born in Susquehanna, Pa., in 1866, having served most of his time in the mechanical departments of various railroads, until about ten years ago, when he entered the railway supply field.

The Crane Company, Chicago, has concluded negotiations for the purchase of more than 100 acres of land at South Kedzie and Archer avenues, to be used for a central plant, to cost about $7,000,000 and employ 6,000 men. It is proposed to bring together on one side the various separate units of the Crane Company which are now located in various parts of the city. Work on the new plant will be started early next year.

At the annual meeting of the Pullman Company, Chicago, Le Roy Kramer was elected assistant to the president, succeeding C. S. Sweet, deceased. Mr. Kramer has held this position by appointment. All the officers of the company were re-elected and the directors were re-elected, except that F. O. Lowden succeeds H. C. Hulbert, deceased. George F. Baker was made a member of the executive committee, succeeding Mr. Hulbert.

Henry W. Jacobs, president of the Oxweld Railroad Service Company, Chicago, has returned from a five weeks' trip abroad, in which he gave special attention to the investigation of oxy-acetylene welding and to the manufacture and exploiting of the Jacobs-Shupert fireboxes abroad. Arrangements for the handling of the Jacobs-Shupert fireboxes were made with Ganz & Company, of Budapest, Hungary, who have three large plants in Europe and make a specialty of building railway equipment, steamships, heavy gas engines and electrical machinery.

Cyril J. Atkinson, mechanical engineer, inventor and patentee of the Atkinson gas producer and other special devices pertaining to gas producers, has gone with Fairbanks, Morse & Company, of Chicago, who have assumed the Atkinson patents. This company will place Mr. Atkinson's service at the disposal of the public for adapting the Fairbanks Morse gas producers to meet the requirements of the industries desiring to substitute producer gas for fuel oil. Mr. Atkinson was previously connected with the Dornfeld-Kunert Company, Watertown, Wis.

J. W. Wright, formerly sales manager of Griscom-Spencer Company, has taken a position with the Magnolia Metal Company, New York, as special representative on the Pacific coast, with headquarters at San Francisco, Cal. William H. K. Gamble, formerly southern representative of Chas. A. Schieren & Company, will be the special representative in the southwestern territory, with headquarters at Dallas, Tex. A. E. Trachsel, formerly export sales manager of the Peerless Rubber Manufacturing Company, will travel throughout the West Indies and Latin American countries as their special representative. Gove S. Taylor has been made a representative in the Pittsburgh district and surrounding territory. Mr. Taylor was formerly manager of the Peerless Rubber Manufacturing Company.

CATALOGS

Unions.—The Jefferson Union Company, Lexington, Mass., has issued folders illustrating its straight, tee and elbow unions. These unions have a brass seat ring.

Vises.—The Emmert Manufacturing Company, Waynesboro, Pa., has issued a 32-page catalog describing the various Emmert vises and giving a table of dimensions together with the prices.

Second Hand Locomotives.—H. F. Wardwell, Railway Exchange, Chicago, is issuing folders which illustrate and briefly describe overhauled locomotives and cars that he has for sale.

Extinguishers.—The H. W. Johns-Manville Company, New York, has issued a 12-page booklet describing the uses and construction of the J-M Success liquid chemical fire extinguishers. A price list is included.

Car Seats.—A 52 page catalog, designated as No. 204, is being issued by the J. G. Brill Company, Philadelphia, Pa. Seats for passenger cars of all kinds, more specially, however, for electric cars, are shown therein. Each type is illustrated and full dimensions and specifications are given.

Power Transmission Machinery.—Shafting, shaft couplings, pillow blocks, shaft hangers, belt tighteners, pulleys, clutches and similar parts are fully described and illustrated in a catalog being issued by the Dodge Manufacturing Company, Mishawaka, Ind. A complete price list for the full range of sizes is included.

Cylinder Cock.—A folder has been issued by the Watertown Specialty Company, Watertown, N. Y., illustrating and describing the Watertown automatic cylinder cock. This is small in size but has large port openings. It is so constructed that when the engine is running the valve automatically closes and as soon as the throttle is closed it automatically opens, allowing the cylinder to drain.

Fuel Economizer, Heating Plants, Blowers, etc.—A condensed catalog, No. 145, of the products of the Green Fuel Economizer Company, Matteawan, N. Y., has just been published. This company manufactures fuel economizers, draft fans, hot air heating systems, drying equipments, hot blast heaters, blowers, exhaust fans, ventilator wheels and steam fan engines. A brief description of these is included in the catalog together with a table of sizes and dimensions.

Grinding Wheels.—The Travelers Insurance Company, Hartford, Conn., is preparing a series of pamphlets which will cover the whole field of mechanical appliances and factory conditions that are dangerous to the lives and physical welfare of employees in all lines of work. It is on the subject of grinding wheels and contains 27 pages. It is illustrated and points out the details of both the design and operation of the machines that should be carefully watched in order to reduce the possibility of personal accidents.

Monorail Telpherage System.—An improvement has been made in the track-switch of the monorail telpherage system made by the Shaw Electric Crane Company, Muskegon, Mich. This switch has no moving parts and when once in place needs no further attention. The steering is done by the trolley operator who deflects the leading truck in the desired direction. This new arrangement is clearly described in Bulletin No. 73, which was recently published by the company. It also contains illustrations of various installations and tables of dimensions of the F. T. Trolleys of the single lift type.

Compression Yoke Riveters.—A clear explanation of the manner in which the Hanna type riveter obtains a maximum pressure through a considerable space and will drive rivets through either two or three ½ in. plates giving equally satisfactory results in both cases, without any adjustment of the die or die screw, is given in catalog No. 3, being issued by the Vulcan Engineering Sales Company, Fisher building, Chicago, Ill., distributing agents for the Hanna Engineering Works of Chicago. The operation of the machine is shown in diagrammatic form and is fully described. It employs both the toggle and the lever principle, the former being used during the first half of the piston stroke and the latter during the balance. The catalog also illustrates and describes the constructional features of the machine and shows it as arranged in a number of different sizes. A sectional view, with a full list of the names of the parts, is included.

Blue Printing Appliances.—Continuous blue printing machines, often accompanied by automatic, rapid dryers, now form a part of most progressive drafting offices. The opportunity for promptly obtaining a print without reference to the time of day or to the weather conditions appeals strongly to most managers and the further opportunity of locating the blue printing room in a small space wherever convenient, without reference to its window exposure or even to the presence of daylight, is very convenient for drawing rooms located in office buildings. In connection with the revolutionary change in the method of printing caused by the introduction of machines of this type, improvements in the other apparatus used in the same connection have been greatly encouraged and machines for making the paper and for washing and trimming the prints have now reached a high state of perfection. A catalog being issued by The C. F. Pease Company, 166 West Adams street, Chicago, illustrates and describes various machines for the blue print room. A suggested typical layout for a moderate sized room is included.

General Electric Company Bulletins.—A number of new bulletins, some of which supersede previous publications, are being issued by the General Electric Company, Schenectady, N. Y. Among these are No. A4004 fully covering the construction and operation of a steam flow meter. This supersedes No. 3846 on the same subject. Bulletin No. A4039 is devoted to direct current motor starting and speed regulating rheostats and panels and supersedes Nos. 4532, 4459 and 4600. Type RI single phase motors are described in bulletin No. 4993, which supersedes No. 4855. No. A4036 supersedes No. 4917 on the subject of direct current excitor switchboard panels. Among the new bulletins is one on small switchboards for use with gasoline-electric sets. This is designated as A4307. Current-limiting reactance which is a device to be placed in series with generators and transformers to limit the flow in the circuit under short-circuit conditions, forms the subject of bulletin No. 4974. Bulletin No. A4034 illustrates and describes the type W long life flame arc lamp which is designed for street illumination.

Steam Turbines.—The DeLaval Steam Turbine Company, Trenton, N. J., has issued catalog D describing its multi-stage turbines. The book is very complete, being divided into five sections. The first section concerns the use of the single stage turbine, giving its various applications and a description of its important features. Section two considers the choice of the type of turbine to be used for various classes of work. This section will be found of special interest to shop engineers, or power plant designers in making their choice of power. Different types of turbines are considered for both direct and alternating current generators, centrifugal pumps and blowers. Section three considers the design and construction of the multi-stage turbine in detail. Various illustrations are shown, which makes the chapter comprehensive. Section four is devoted to the double helical speed reduction gear. This is of special design and has given excellent service. The fifth section compares the DeLaval multi-stage turbines with reciprocating engines, the special points considered being safety, steam consumption and adaptability for various kinds of work. The catalog is well illustrated and contains the DeLaval diagram and steam scale.

Railway Age Gazette

DAILY EDITION

Copyright, 1912, by the Simmons-Boardman Publishing Co.

Vol. 52. NEW YORK—JUNE 12, 1912—ATLANTIC CITY. No. 23a.

PUBLISHED EVERY FRIDAY AND DAILY EIGHT TIMES IN JUNE, BY SIMMONS-BOARDMAN PUBLISHING CO., 83 FULTON ST., NEW YORK.

CHICAGO: 417 South Dearborn St. CLEVELAND: Citizens Bldg.
LONDON: Queen Anne's Chambers, Westminster.

E. A. SIMMONS, *President.*
L. B. SHERMAN, *Vice-President.* HENRY LEE, *Sec'y & Treas.*
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Subscriptions, including 52 regular weekly issues and special daily editions published from time to time in New York, or in places other than New York, payable in advance and postage free:

United States and Mexico	$5.00
Canada	6.00
Foreign Countries (excepting daily editions)	8.00
Single Copies	15 cents each

Engineering and Maintenance of Way Edition and the four Maintenance of Way Convention Daily issues, North America, $1.00; foreign, $2.00.

Entered at the Post Office at New York, N. Y., as mail matter of the second class.

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IN passenger service the weight of coaches, sleepers and all other cars, excepting baggage and express cars, is practically constant, and the brake power is usually over 100 per cent. of the car weight, but in freight service this power is 75 to 80 per cent. of the light weight of the car, or only about 15 per cent. of the total weight of car and lading. It has been thought desirable for a long time to increase the brake power when freight cars are loaded with a heavy tonnage, and the extensive use of 50-ton ore and coal cars has stimulated the effort to produce a practical brake which will accomplish this purpose. Such a brake, known as the light and loaded equipment brake, is now in successful use on a number of western lines, where heavy mountain grades have made it essential for safe operation. The experience with the brake in such places has demonstrated that it possesses incidental advantages which render it a desirable equipment for all lines where a heavy traffic in coarse commodities is hauled, not only in solid trains of 50-ton cars, but when such cars are mixed with lighter loads. By the use of this new brake equipment the operation of heavy trains on the level is made smoother and safer, and it is probable that these advantages will lead to its introduction on lines in mineral districts where grades are light.

FOR some time the principal interest in published articles on car wheels has centered in the steel wheel, and little has been said as to the merits of the chilled cast iron wheel. The communication regarding cast iron wheels, which we publish on another page, will, therefore, be read with in-

terest. The figures showing the very large number of cast wheels in service, and the low cost of the wheels per car per year indicate the vast benefits the railways have obtained from the use of this wheel and the important contribution it has made toward the low cost of freight transportation in this country. Although its limitations as to car capacity have been frequently announced, the cast iron wheel continues to render good service under the heaviest freight equipment, and the makers do not hesitate to recommend it for the highest capacity cars thus far contemplated. The principal limiting feature is the flange, which for obvious reasons has not increased with the comparatively small increase in other dimensions, and the plea of the wheel makers for a larger space between main and guard rails so that thicker flanges can be used, is one which should be seriously considered by railway managers.

THE first convention of the Master Car Builders' Association to be held at Saratoga was in 1884 and the next in 1892. It was held in the same place for five successive years, 1900 to 1904 inclusive. The first one held in Atlantic City was in 1906, and since that time it has been the accepted place, so that the present meeting is the seventh to be held here. At the meeting twenty years ago in Saratoga, the total membership reported was 298, and the number of cars represented was 1,071,219. The president, John Kirby, the "grand old man" who is still with us, announced that 150,000 freight cars were then equipped with automatic couplers. The Fox pressed steel truck was then such a novelty that special attention was called to its merits. In referring to the rules of interchange, Mr. Kirby said, "I hope no very radical changes will be made in these rules. They have been in operation long enough to demonstrate that the less intricate they can be made the more useful they will be to those who have to do with the interchange of cars. Lop off only such excrescences as tend more to perplex than to enlighten." The reports read at this meeting included one on cast wheels, in which the advantages of the contracting chill were explained, and one on wheel tests made at the Sacramento shops of the Southern Pacific in 1891. These tests were made with a view of determining the cause of the frequent cracking of wheel plates on mountain grades, and they led to the use of the rim heating test in the cast iron wheel specification. At this meeting the first complete specification for automatic couplers was presented; it included the limit gages and required that couplers must endure a pulling test of not less than 100,000 lbs. and under the drop they must stand three blows from 10 ft. and two blows from 15 ft. A brief report on freight car truck frames considered the relative advantages of swinging and rigid bolsters; a majority of replies to the circular favored the rigid type.

IMPROVED BRAKE METHODS

THE remarkable improvements which have been made in air brake mechanism and brake methods in the past three years have not yet received prominent notice, chiefly for the reason that they have not been applied to any large extent, and some of them remain to be thoroughly tested in a service which will properly represent general practice. These improvements are the results of the severe demands which are made on the brake apparatus by the increase in the weight of cars, the increase in the speed of trains and the heavier brake shoe pressure which such service requires. Progress in the development of most railway appliances is the result of undue wear or the breaking down of structures which are too weak for the increasing loads placed on them, and air brake improvements are following a similar course.

The increase in the weight of passenger equipment continued gradually until it was found that the best stop which could be made by existing brake equipment was considerably longer than that made in previous years with lighter equipment. The improvements in the brake apparatus found necessary to meet this condition have considerably increased the ratio of brake power to car weight and the brake shoe pressure, and this in turn has increased the wear of brake shoes to such an extent that methods are now sought to economize in brake shoe expense.

The extent to which the ratio of brake power to car weight must be increased with various wheel loads in order that the stop may be made in 1,000 to 1,200 ft. is shown in Fig. 1 in our report of the annual meeting of the Air Brake Association. (RAILWAY AGE GAZETTE, May 17, page 1093.) In Fig. 2 on the same page is shown the relative braking power required for cars of different weights to produce the same retarding force, or length of stop. These diagrams are worthy of careful study, as they reveal the brake necessities of modern passenger service, and show at once that present methods now in general use are not equal to the requirements. They are from a paper by R. C. Augur on Friction and Wear of Brake Shoes as Affected by the Wheel Load or Car Weight, which is an admirable presentation of the present day brake problem so far as it is affected by brake shoe conditions. The author's study of the accumulated results of brake tests and brake shoe tests convinces him that the present method of proportioning braking power on passenger cars to 90 per cent. of the weight, based on a brake cylinder pressure of 60 lbs., is no longer tenable and must become obsolete in the near future. In order to operate fast passenger trains with smoothness and safety it is necessary to adopt a sliding scale for proportioning braking power, and it is proposed where 90 per cent. is assumed as satisfactory brake power for cars having a wheel load below 6,000 lbs. that for every 100 lbs. increase in wheel load in excess of 6,000 lbs. an addition of one per cent. braking power should be made.

The efficiency of the brake depends largely on the coefficient of friction of the brake shoe, in fact, they may be regarded as identical, and as an average for passenger car conditions this coefficient is only about 12 per cent. Brake power should, therefore, be proportioned in accordance with the laws of brake shoe friction and in order to allow for the decrease of the coefficient with heavy brake beam pressures, increasingly higher percentages of brake power should be used as the weight of cars is increased. A study of the tests made on the M. C. B. brake shoe testing machine, as reported in the 1911 M. C. B. proceedings, shows that the work in stopping from a speed of 60 miles per hour is 2.25 times that in stopping from 40 miles per hour, and the actual amount of metal worn from the shoes on a 90,000 lb. car at a 60-mile stop is 2.5 times as much as from a 40-mile stop, while with a 120,000 lbs. car it is 3.2 times as much. This is an indication of the rapid wear of brake shoes under present conditions of brake equipment, in spite of the steady effort and intelligent work that has been done in improving the quality of the brake shoe metal.

It is possible that brake shoe pressures now found necessary for efficient braking are higher than good practice would dictate, and it is desirable to make improvements in other directions, as lower pressure would result in a higher coefficient of friction and a lower rate of wear. At the recent meeting of the Air Brake Association the advantages of clasp brakes, where two shoes are used for each wheel, were demonstrated, and the practice as now employed by the Philadelphia and Reading on four-wheel and six-wheel trucks was explained. By this method a sufficient retarding effect is obtained with moderate brake shoe pressures, and less wear and lower temperatures for the shoe and wheel. The new all-steel suburban cars for the New York, Westchester & Boston are also equipped with clasp brakes.

Announcements.

PROGRAM OF THE WEEK.

MASTER CAR BUILDERS' CONVENTION.

WEDNESDAY, JUNE 12.

Prayer	9.30 A. M. to 9.35 A. M.
Address by the president	9.35 A. M. to 10.30 A. M.
Reading of the minutes of the last meeting	10.30 A. M. to 10.35 A. M.
Report of the secretary and treasurer	10.35 A. M. to 10.50 A. M.
Assessment and announcement of annual dues; appointment of committees on correspondence, resolutions, obituaries, etc.	10.50 A. M. to 11.00 A. M.
Election of auditing committee	11.00 A. M. to 11.05 A. M.
Unfinished business	11.05 A. M. to 11.10 A. M.
New business	11.10 A. M. to 11.20 A. M.
Discussion of reports on:	
Nominations	11.20 A. M. to 11.30 A. M.
Revision of Constitution	11.30 A. M. to 11.45 A. M.
Revision of Standards and Recommended Practice	11.45 A. M. to 12.00 M.
Train Brake and Signal Equipment	12.00 M. to 12.30 P. M.
Brake Shoe Equipment	12.30 P. M. to 1.00 P. M.
Car Wheels	1.00 P. M. to 1.30 P. M.

THURSDAY, JUNE 13.

Discussion of reports on:	
Safety Appliances	9.30 A. M. to 10.00 A. M.
Rules of Interchange / Prices for Labor and Materials.	10.00 A. M. to 10.30 A. M.
Rules for Loading Material	10.30 A. M. to 10.45 A. M.
Damage to Freight Equipment by Unloading Machines	10.45 A. M. to 11.00 A. M.
Overhead Inspection	11.00 A. M. to 11.15 A. M.
Coupler and Draft Equipment	11.15 A. M. to 12.15 P. M.
Car Trucks	12.15 P. M. to 12.30 P. M.
Springs for Car Trucks	12.30 P. M. to 1.00 P. M.
Consolidtion	1.00 P. M. to 1.10 P. M.
Train Lighting and Equipment	1.10 P. M. to 1.30 P. M.

FRIDAY, JUNE 14.

Individual paper, Car Shop Apprentices, I. S. Downing, M. C. B., L. S. & M. S.	9.30 A. M. to 10.00 A. M.
Discussion of reports on:	
Train Pipe and Connections for Steam Heat	10.00 A. M. to 10.30 A. M.
Tank Cars	10.30 A. M. to 11.00 A. M.
Specifications for Tests of Steel Truck Sides and Bolsters	11.00 A. M. to 11.30 A. M.
Capacity Marking of Cars	11.30 A. M. to 11.45 A. M.
Lettering Cars	11.45 A. M. to 12.00 M.
Unfinished business; reports of committees on correspondence, resolutions and such other committees as may be named during the convention	12.00 M. to 12.15 P. M.
Election of officers	12.15 P. M. to 1.30 P. M.

Adjournment.

ENTERTAINMENT.

WEDNESDAY, JUNE 12.

Orchestra Concert, 10.30 A. M.—Entrance Hall, Million Dollar Pier.

Orchestra Concert, 3.30 P. M.—Entrance Hall, Million Dollar Pier.

Social Gathering and Informal Dance, 9.00 P. M.—Blenheim Exchange, Marlborough-Blenheim Hotel.

THURSDAY, JUNE 13.

Orchestra Concert, 10.30 A. M.—Entrance Hall, Million Dollar Pier.

Orchestra Concert, 3.30 P. M.—Entrance Hall, Million Dollar Pier.

Informal Dance, 9.30 P. M.—Entrance Hall, Million Dollar Pier.

FRIDAY, JUNE 14.

Orchestra Concert, 10.30 A. M.—Entrance Hall, Million Dollar Pier.

Orchestra Concert, 3.30 P. M.—Entrance Hall, Million Dollar Pier.

Musicale, 9.00 P. M.—Entrance Hall, Million Dollar Pier.

SATURDAY, JUNE 15.

Orchestra Concert, 10.30 A. M.—Entrance Hall, Milion Dollar Pier.

Base Ball Parade, 2.00 P. M.—Million Dollar Pier to special trolley cars.

Base Ball Game, 3.00 P. M.—East v. West, Pennsylvania Railroad Company's Inlet Park Base Ball Grounds. Free trolley cars for those wearing the official badge.

SUNDAY, JUNE 16.

Concert, 11.00 A. M.—Marlborough-Blenheim Hotel Orchestra, Leo Sachs, musical director: Largo (*Handel*); Two Intermezzi from the Opera, The Jewels of the Madonna (*Wolf-Ferrari*); Andante Cantabille from the String Quartet (*Tschaikowski*); Serenade (*Drdla*); Suite (*Kate Vannah*); (a) Dawn (b) Sleepy Baby; Fantasie, La Boheme (*Buccini*), Violin Solo; Andante from the Concerto (*Bruch*), Michael Benner; Ave Maria (*Gounod*).

CONCERT, 8.45 P. M.—Overture, Tannhauser (*Wagner*), Violin Solo; Faust Fantasie (*Wieniwski*), Michael Benner; Fantasie Samson et Delila (*Saint-Saens*), Cello Solo; Tartantalla (*Popper*), Leo Sachs; The Lost Hope (*Gottschalk*), Piano Solo; Polonais (*Liszt*), Henry Gruhler; Hungarian Rhapsody No. 2 (*Liszt*).

M. C. B. ASSOCIATION OFFICERS, 1911-1912.

President, A. Stewart, G. S. M. P. & E., Southern Ry.; first vice-president, D. F. Crawford, G. S. M. P., Penna. Lines; second vice-president, C. E. Fuller, A. G. M., Union Pacific; third vice-president, M K. Barnum, G. S. M. P., Illinois Central; treasurer, John S. Lentz, M. C. B., Lehigh Valley; secretary, Joseph W. Taylor, Chicago. Executive members, J. D. Harris, Baltimore, Md.; Henry Bartlett, G. S. M. D., Boston & Maine; C. A. Seley, M. E., C. R. I. & P.; F. W. Brazier, S. R. S., N. Y. C. & H. R.; C. A. Schroyer, S. C. D., C. & N. W.; Alex. Kearney, A. S. M. P., Norfolk & Western.

STANDING COMMITTEES.

Arbitration.—J. J. Hennessey (chairman), M. C. B., C. M. & St. P.; T. W. Demarest, S. M. P., Penna. Lines; J. S. Lentz, M. C. B., Lehigh Valley; E. D. Bronner, S. M. P., Mich. Cent.; M. K. Barnum, G. S. M. P., Illinois Central.

Revision of Standards and Recommended Practice.—T. H. Goodnow (chairman), M. C. B., Armour Car Lines; W. E. Dunham, supervisor M. P., C. & N. W.; W. H. V. Rosing, asst. to V. P., St. L. & S. F.; C. E. Fuller, A. G. M., Union Pacific; T. M. Ramsdell, M. C. B., Ches. & Ohio; O. C. Cromwell, M. E., Balto. & Ohio R. R.

Train Brake and Signal Equipment.—R. B. Kendig (chairman), G. M. E., N. Y. C. Lines; T. L. Burton, gen. inspr., C. R. R. of N. J.; B. P. Flory, S. M. P., N. Y. O. & W.; E. W. Pratt, A. S. M. P., C. & N. W.; R. K. Reading, S. M. P., Penna. Lines.

Brake Shoe Equipment.—Chas. H. Benjamin (chairman), Purdue University; C. D. Young, eng. tests., Penna. R. R.; R. B. Kendig, G. M. E., N. Y. C. Lines, New York City.

Coupler and Draft Equipment.—R. L. Kleine (chairman), C. C. I.; G. W. Wildin, M. S., N. Y. N. H. & H.; F. W. Brazier, S. R. S., N. Y. C. & H. R.; F. H. Stark, Supt., Pittsburgh Coal

Co.; H. La Rue, M. C. B., C. R. I. & P.; H. L. Trimyer, M.C. B., S. A. L.; J. F. Devoy, A. S. M. P., C. M. & St. P.

Rules for Loading Materials.—A. Kearney (chairman), A. S. M. P., N. & W.; R. E. Smith, G. S. M. P., A. C. L.; C. H. Osborne, A. S. C. D., C. & N. W.; L. H. Turner, S. M. P., P. & L. E.; W. F. Kiesel, Asst. Mech. Engr., Penna.

Car Wheels.—Wm. Garstang (chairman), S. M. P., C. C. C. & St. L.; W. C. A. Henry, S. M. P., Penna. Lines; A. E. Manchester, S. M. P., C. M. & St. P.; R. W. Burnett, G. M. C. B., Can. Pac.; R. L. Ettenger, C. M. E., Southern Ry.; J. A. Pilcher, M. E., N. & W.; O. C. Cromwell, M. E., B. & O. R. R.

Safety Appliances.—A. Stewart (chairman), G. S. M. P. & E., Southern Ry.; A. La Mar, M. M. I., Penna. Lines; C. B. Young, M. E., C. B. & Q.; H. Bartlett, G. S. M. P., B. & M.; T. M. Ramsdell, M. C. B., C. & O.; M. K. Barnum, G. S. M. P., Ill. Cent.; W. O Thompson, M. C. B., N. Y. C. & H. R.

SPECIAL COMMITTEES.

1. Car Trucks: A. S. Vogt (chairman), M. E. Penna.; C. A. Seley, M. E., C. R. I. & P.; J. J. Tatum, S. F. C. D., B. & O.; G. A. Hancock, G. S. M. P., St. L. & S. F.; F. P. Pfahler, M. E., Wheeling & Lake Erie; N. L. Friese, G. F. C. D., N. & W.

2. Prices for Labor and Material: F. H. Clark (chairman), G. S. M. P., B. & O.; G. E. Carson, D. M. C. B., N. Y. C. & H. R.; C. F. Thiele, G. C. I., P. C. C. & St. L.; Ira Everett, G. F. C. R., Lehigh Valley; B. Julien, G. C. F., Union Pacific; S. T. Park, S. M. P., C. & E. I.; H. E. Passmore, M. M., T. & O. C.

3. Springs for Freight Car Trucks: W. F. Kiesel (chairman), Asst. Mech. Engr., Penna.; T. A. Lawes, M. E., N. Y. C. & St. L.; J. R. Onderdonk, Engr. Tests, B. & O.; J. Haines, S. M. P., Southern Ry.

4. Consolidation: F. H. Clark (chairman), G. S. M. P., B. & O.; W. A. Nettleton; C. A. Schroyer, S. C. D., C. & N. W.

5. Train Lighting and Equipment: T. R. Cook (chairman), M. M., Penna. Lines; C. A. Brandt, M. E., C. C. C. & St. L.; Ward Barnum, elec. engr., L. & N.; J. H. Davis, elec. engr., B. & O.; E. A. Benson, M. S., Pullman Co.; D. J. Cartwright, elec. engr., Lehigh Valley; E. W. Jansen, elec. engr., Illinois Central.

6. Train Pipe and Connections for Steam Heat: I. S. Downing (chairman), M. C. B., L. S. & M. S.; C. A. Schroyer, S. C. D., C. & N. W.; T. H. Russum, S. P. C. D., B. & O.; J. J. Ewing, M. E., C. & O.; W. C. Arp, S. M. P., Vandalia R. R., Terre Haute, Ind.

7. Nominations: A. W. Gibbs (chairman), C. M. E., Penna. Lines; C. A. Seley, M. E., C. R. I. & P.; W. H. Lewis, S. M. P., N. & W.; J. F. Walsh, G. S. M. P., Ches. & Ohio; H. H. Vaughan, asst. to V.-P., Can. Pac.

8. Arrangements: A. Stewart, G. S. M. P. & E., Southern Railway.

9. Tank Cars: A. W. Gibbs (chairman), C. M. E., Penna. Lines; Thomas Beaghan, Jr., M. C. B., Union Tank Line; J. W. Fogg, M. M., B. & O., Chicago Ter. Ry.; S. K. Dickerson, A. S. M. P., L. S. & M. S.; C. E. Chambers, S. M. P., C. R. R. of N. J.; E. J. Searles, asst. to G. S., B. & O; Wm. Schlafge, G. M. S., Erie.

10. Specifications for Tests of Steel Truck Sides and Bolsters for Cars of 80,000, 100,000 and 150,000 Pounds Capacity: E. C. Schmidt (chairman), University of Illinois; J. S. Sheafe, engr. tests, Illinois Central; C. D Young, engr. tests, Penna.

11. Capacity Marking of Cars: C. E. Fuller (chairman), A. G. M., Union Pacific; M. K. Barnum, G. S. M. P., Ill. Central; A. W. Gibbs, C. M. E., Penna. Lines; F. H. Clark, G. S. M. P., B. & O.; F. W. Brazier, S. R. S., N. Y. C. & H. R.

12. Revision of Constitution: D. F. Crawford (chairman), G. S. M. P., Penna. Lines; C. A. Seley, M. E., C. R. I. & P.; A. Kearney, A. S. M. P., N. & W.

13. Lettering Cars: D. F. Crawford (chairman), G. S. M. P., Penna. Lines; F. H. Clark, G. S. M. P., B. & O.; W. A. Nettleton; F. A. Torrey, G. S. M. P., C. B. & Q.; D. R. MacBain, S. M. P., L. S. & M. S.

BATHING ACCOMMODATIONS.

Accommodations for bathing may be had by all members and guests of the conventions wearing the official badges at the following rates, including suits:

Reed's Baths (Boardwalk under Hotel Dennis)—25 and 50 cents per person.

Brighton Casino (With indoor swimming pool)—50 cents per person.

Free admission to the Brighton Casino (including concert, reading and writing rooms) will be given to members and guests wearing official badges.

These rates apply only to those wearing the official badge.

WEAR YOUR OFFICIAL BADGE.

As all members and guests of the associations are not known to the entertainment committee, who must use due diligence to insure their protection and privileges, they will greatly assist in this work by wearing their official badges at all times during the conventions.

COMPLAINTS.

The committee of arrangements, A. Stewart, H. T. Bentley and B. E. D. Stafford, will be glad to undertake to adjust all complaints of any nature during the convention. Communications should be sent to the office of the secretary of the Railway Supply Manufacturers' Association, Million Dollar Pier.

STENOGRAPHIC SERVICE.

Two Edison business phonographs have been installed in Booths 625 and 627 (near Convention Hall), where they may be used without charge by railway and supply men. The machines will be in the hands of competent operators, and all are cordially requested to make liberal use of them in handling correspondence.

ROLLING CHAIRS.

The Shill Rolling Chair Company has been officially authorized to rent rolling chairs for the use of the members and guests wearing official badges of the conventions. Coupons will be issued in books of 10 and 20 coupons, each coupon 25 cents. The purchaser will be allowed a discount of 20 per cent from the face value of each book purchased, and the coupon will be accepted by the chair company for use of chair at face value. These coupons will be good both day and evening.

Rental Rates for Chairs.—One or two persons, 50 cents per hour. Three persons, 75 cents per hour. After the first hour, half-hour fractions will be charged. Special trips, hotel to pier, pier to hotel, or hotel to hotel, 25 cents per person, when the station manager is notified in advance and the trip made direct without stops. Double chairs, with attendant, from 9 a. m. to 6 p. m., $2.50 per day. Double chairs, with attendant, from 9 a. m. to 12 midnight, $4 per day. When the chair is engaged by the hour, the time to return to the original station is included.

All chairs must be engaged at the following stations, at which the coupon books may be procured. Ostend Hotel, Shelburne Hotel, Dennis Hotel, Berkley Cafe, Chalfonte Hotel, N. Carolina Ave., Bothwell Hotel, Seaside Ave., Gladstone Hotel, Marlborough Hotel, Traymore Hotel, Princess Hotel, Haddon Hall, Pennsylvania Ave., Islesworth Hotel, Rudolph Hotel, Million Dollar Pier, Blenheim Hotel, Brighton Hotel, 1239 Boardwalk, Strand Hotel, Virginia Ave., St. Charles Hotel and Royal Palace Hotel.

TELEPHONES ON THE PIER.

A Bell telephone will be placed between each two exhibit booths on the pier. These are available for free local service for exhibitors. Long-distance calls can also be made from these stations.

GOLF.

The Country Club of Atlantic City extends the privilege of its club house to all members and guests during their stay, and admission to the grounds will be by official badge. It also extends the privilege of the links for a charge of $1.00 per day, and tickets may be obtained from the steward at the club. The club is located at Northfield and may be reached at half-hour intervals by the Shore Fast Line Electric, leaving from the Boardwalk and Virginia avenue, also by the Atlantic City & Suburban Traction Company, leaving from Florida avenue and the Boardwalk. The running time is about 20 minutes.

U. S. MAIL.

Mail, addressed care of Secretary's Office, Million Dollar Pier, will be taken care of and distributed when called for at that office.

RAILWAY SUPPLYMEN'S MEETING.

The annual meeting of the Railway Supply Manufacturers' Association will be held in the convention hall on Young's New Million Dollar Pier, Saturday, June 15, at 10.30 a. m. District meetings for the election of the executive committee members will be held on Friday, June 14, between 10 a. m. and 12 noon, in the office of the executive committee, which adjoins the enrollment booth at the pier entrance.

ENROLLMENT.

The registration booth at the entrance to the pier was opened yesterday morning. This morning it will be opened at 8 30, and it is urged members of the association register as early as possible.

Members of the Master Car Builders' Association are required to pay $1.00 for each badge for themselves or for their guests. Members of the Master Mechanics' Association will be registered this week only as guests of the M. C. B. Association, and will be required to pay $1.00 for each badge.

The M. M. registration begins at 7.30 P. M. Saturday, and from this time on no charge will be made for M. M. badges.

To facilitate the registration of members, ladies and guests of the Railway Supply Manufacturers' Association, members will first go to the treasurer, who is at one end of the enrollment booth, and receive a card showing that dues and fees for additional badges have been paid. If not already paid, the treasurer will receive payment at this time. The member will then fill out the card and present it at the enrollment booth, where the card will serve as an order on the enrollment committee for the badge or badges.

THE BALL GAME.

The annual ball game will take place at the Inlet Park ball grounds on Saturday afternoon. The captain of the Western team is Harry S. Hammond, Pressed Steel Car Company, Pittsburgh, Pa., and the captain of the Eastern team is T. P. O'Brian, O. M. Edwards Company, New York City. The managers in charge of the game are G. W. Wildin, New York, New Haven & Hartford, New Haven, Conn., and F. M. Nellis, Westinghouse Air Brake Company, Boston, Mass.

The rules governing eligibility for players are the same as last year. They are as follows:

(1) Teams to be composed of 12 men in uniforms—8 railway supply men, 4 railway men.

(2) Supply men must be in the sales department, or those who call on railways or car companies and solicit business.

(3) No one who is in the shop end alone shall be allowed to play.

(4) No one to be allowed to play who comes to Atlantic City for the base ball game alone. He must be in attendance as a representative of a supply company and registered as such.

(5) Railway men to play must be members of either the M. M. or M. C. B. Association. Men working in the shops cannot play.

(6) Members' names and occupations, firm and railway names included, to be submitted to Philip J. Mitchell, chairman of the entertainment committee.

(7) If for any reason a change in team is necessary, names shall be submitted to and passed upon by the managers, Messrs. Wildin and Nellis, as well as to Mr. Mitchell.

(8) No player shall be eligible who has not been employed as salesman for at least one year by a railway supply company, or who has not been a member of the M. M. or M. C. B. Association for at least one year.

(9) No variation from these rules will be permitted.

(10) Pittsburgh, Pa., will be in the western territory, and Buffalo, N. Y., in the eastern.

THE FRIDAY EVENING ENTERTAINMENT.

The musicale, which is to be given on the pier on Friday evening will begin at 9.00 o'clock. It will last about an hour, and, judging from the program which the committee has provided, it will prove a decidedly attractive means of getting people together at the pier.

THE DANCES.

The informal dance to be held to-night at the Marlborough-Blenheim and the dance at the pier to-morrow night are intended to be really informal. That is, evening dress is by no means obligatory, and it is expected that those who attend will wear evening or day clothes according to which is most convenient.

TAXICAB AND GARAGE SERVICE.

The C. J. Sedlag Company, with main office at Tennessee and Atlantic avenues, has contracted to provide taxicabs for members and guests wearing official badges, at the following rates: For each person hauled, within the city limits, 25 cents per person; hourly rate, for one to five people, $3 per hour. Taxicabs are to be available at the Marlborough-Blenheim hotel, Million Dollar Pier and at the stations of the taxicab company. Garage service for private machines will be provided by this company at the following rates: 75 cents per day without service; $1.50 per day with service; $7 per week with service.

INVITATION TO ARMY AND NAVY.

The Railway Supply Manufacturers' Association has extended a special invitation to the Secretary of War and the Secretary of Navy inviting them, or any others under their jurisdiction, to attend and inspect this year's exhibit. It is not learned yet whether any from either department will be present.

A RAILWAY PLANK FOR BOTH POLITICAL PLATFORMS.

The conventions to be held in Atlantic City this week and next are not the only important conventions that are scheduled for early dates, and the Railway Business Association is moving to get the two great political parties to insert in the platforms that will be adopted railway planks that will tend to cause a less restrictive policy of railway regulation and thereby stimulate the development of transportation facilities. The association has issued bulletin No. 11 entitled, "Duty of the Political Parties to the Shippers," and is asking shippers to sign the following petition and forward it to the office of the association at 2 Rector street, New York City:

"The undersigned shippers and receivers of freight, in our own interest, respectfully urge the national conventions of the political parties to declare a policy toward railways which, while emphasizing the necessity for their regulation to prevent discrimination and excessive charges; to safeguard life and to promote the convenience and comfort of the public, will:

"Give careful heed to the promotion of their prosperity and growth.

"Ascertain in considering enactments compelling expenditures that they possess the resources to meet such outlays without injury to efficient service;

"Provide that in all adjustments of rates ample revenue shall be insured them to meet existing obligations and to attract capital for necessary improvements and extensions."

Shippers attending the conventions—and there are many railway supply men attending who are very large shippers—may sign the petition by calling at the RAILWAY AGE GAZETTE booth. The wording of the petition indicates the nature of the planks that the association is trying to get adopted.

The association in its bulletin presents the following argument for the policy that it advocates:

"The national party conventions soon to meet will adopt in their platforms what they regard as the most important policies of government for the well-being of the country. Such policies will be designed to comprehend the whole range of the public needs and to insure prosperity and progress to the whole people. To these policies each party will pledge itself, and will be expected, in event of success at the polls in November, to shape legislation and administration during the next four years in accordance therewith.

"Among the subjects hitherto considered in the party platforms has been that of railway regulation. This subject will, without doubt, be dealt with again in 1912. It is the purpose of this bulletin to direct the attention of the parties to a phase of that subject involving momentous consequences to the national welfare, twice urged upon congress by the Interstate Commerce Commission, and never yet acted upon—namely, the inadequate supply of railway facilities and the difficulty of dealing with it under regulation as now established. The difficuly lies in the absence of any connection between rate regulation, railway revenues and the demands made upon the railways for service and outlays.

Consumers as well as shippers, farmers as well as manufacturers and their employees, will suffer if facilities are not developed in advance of requirements. Traffic has grown faster than facilities. These cannot be increased by act of legislature or by decrees of courts or commissions.

The political parties would probably be reluctant and, in our judgment, would be unwise in attempting to define within a platform declaration a specific solution. The question is one for thorough investigation and interchange of views.

In the way deemed appropriate to each, the government fosters water transportation, agriculture, forestry, mining, manufactures and foreign trade. The railways need a systematic consideration of their revenues as bearing on their ability to obtain capital and provide track, locomotives and cars. The time has come when rail transportation should be recognized as an industry which the government should encourage as well as regulate.

In the past emphasis has been laid by the parties upon the prevention and discriminations and excessive charges by the railways and the promotion of the public safety. In reiterating these policies, as they should, the parties should place alongside them the promotion of railway development and of carrying capacity as a policy of equal importance and of vital necessity.

The Interstate Commerce Commission said in 1906:

"The inability of shippers to procure cars for the movement of their traffic is the subject of numerous and grievous complaints, which come to the commission from all parts of the country. In some cases it is simply a lack of cars, in others insufficient tracks and motive power, in still others wholly inadequate freight yards and terminal facilities."

In the same report the commission said:

"Broadly speaking, the regulating power of the congress has not been exercised to control the physical operation of interstate railroads—aside from the safety appliance requirements—either as respects the movement of trains or the supply of equipment. To what extent the delegation of authority to the commission to deal with a situation of this kind would be likely to prove of practical value is a question of great difficulty. The commission is not prepared to recommend a definite scheme of legislative relief; but we are amply warranted in bringing the matter to the attention of the congress in this general way and to ask that it receive early and careful consideration."

In 1907 the commission said:

"The general question of the provision of adequate transportation facilities unquestionably merits serious consideration by the congress. The ability of the carriers to transport traffic measures the profitable production of this vast country, with its 90,000,000 of people, abundant capital and practically unlimited resources. Manifestly, it is an economic waste for the farm, the mine or the factory to put labor and capital into the production of commodities which cannot be transported to market with reasonable dispatch. If the present output cannot, in many instances, be transported except after ruinous delays, it is not reasonable to presume that capital will readily seek investment in new undertakings."

The cry for relief to the shippers is as insistent now as in 1905. The danger of congestion of traffic through the inability of the railways to furnish the requisite facilities is as great a menace, probably greater, to the growth and prosperity of our country in the year 1912 than ever before.

It should be frankly stated that the condition of railway finances which was the cause of inadequate growth in facilities in 1906 was not the result of the attitude of the Interstate Commerce Commission in regulating rates. The effective regulation of interstate rates was not authorized until after the car shortage of 1906 and 1907, discussed by the commission in its reports for those years. The largest factor up to that time contributing to the situation as it then existed was the action of the railways themselves in the period of disastrous competition.

The commission since 1910 has been clothed, not only with authority to reduce rates, either upon their own motion or upon complaint, but to suspend proposed advances when tariffs proposing advanced rates are filed with the commission.

A very large body of rates aggregating many millions of revenue have been reduced by order of the commission, many proposed advances have been denied, and the result has been a weakening of revenue supplemental to the impairment which because of increasing costs and rigid rates would have taken place without such decrees. The denial in 1911 of the general advances asked for, although involving comparatively small amounts and on some accounts not disadvantageous to the roads, served to intensify feeling among investors that the regulatory apparatus of the country was operating in the

direction of skimping railway revenues, and the course of miscellaneous decisions since that time has added to this conviction.

The opposite conviction, namely, that the regulatory apparatus will operate in the direction of permitting adequate railway revenues, can only be carried home to investors by a definite and formal declaration that this is to be the policy of the government and systematically enforced.

Most of the rate cases brought before the commission at present do not have as their primary purpose the reduction of rates, but are controversies between communities, individuals or commodities as to the relation of one rate to another.

What is here discussed has no bearing whatever on any general advance in rates. So far as the Railway Business Association is informed no such advance is under consideration. If every schedule in the United States were to be raised to-morrow this would in no way touch the question which is here offered for public discussion. What is urged is that the method of regulating rates should be sufficiently flexible to conform to the needs of industry and to the requirements of the carriers and to insure their fullest efficiency.

The Interstate Commerce Commission has the power of influencing, through rate regulation, what net revenue carriers, or any of them, shall earn. There can be no doubt that in the exercise of this power the commission will be strongly and properly influenced by an evidence of public approval of a policy which shall permit the railroads to accumulate resources and to anticipate the growth of traffic. This approval can best be demonstrated to the commission by a platform declaration by the political parties in convention assembled.

Where discriminations between communities, commodities or individuals are alleged to exist and the rates in themselves are not found to be unreasonable, an opportunity should be offered to the carriers by suggestion on the part of the commission permitting readjustment without compelling a reduction in the aggregate earnings.

What was the "great difficulty" which confronted the Interstate Commerce Commission in 1906 in formulating "a definite scheme of legislative relief" for car shortage and other inadequacies of railway facilities? This great difficulty, although not defined, must have been the fact that every additional car or locomotive, every mile of additional track, every enlargement of terminals provided by the railways must be paid for by them out of money that they could either earn or borrow. Whatever the commission might ascertain by investigation to be the absolute requirement of the shippers in augmented transportation facilities; however many hundreds of millions of dollars the commission might decree must be spent by the railways properly to serve the shippers, their ascertainment and resultant order would be futile, if the railways did not possess the money wherewith to make the investment, or could not persuade investors seeking safe and profitable investment to lend them the money upon such security as they had to offer. They understood, of course, that no government appropriation goes with an edict compelling railway expenditure.

The present chairman of the Interstate Commerce Commission, the Hon. Charles A. Prouty, thoroughly understands this, as is shown by the following extract from an address delivered by him in 1909 at Yale University:

"While we can provide by legislation the sort of cars which a railroad shall use and the rates which it shall impose, we cannot by legislation force one single dollar of private capital into railway investment against its will."

It is clearly recognized by shippers, railway managers and other high authorities that there is acute urgency as well as permanent necessity for dealing vigorously with the subject. Business bodies in resolutions and journals and magazines in editorials are directing attention to the danger and calling for a solution.

The railway managers are vividly alive to their unpreparedness, but they are confronted by a situation of great perplexity. The difficulty is financial and presents itself in two phases.

First, investors are reluctant to take securities on terms which the managers deem prudent. This impairment of borrowing credit is the result of several conditions. The most important of these is the low level of a great body of rates brought about during the period of extreme completion. Then in the face of this influence tending to keep revenues depressed, expenses have increased through a continuous upward movement in wages, a large augmentation in taxes, enormous additions to fixed charges for investments in non-revenue producing improvements made under legislative compulsion or pressure of communities in the direction of safety of the public and of employees and the comfort of passengers, and a substantial increase in operating expenses due to compulsory shortening of hours and labor and other causes incident to regulation. The security, moreover, which railroads are now able to offer is no longer to so great an extent as formerly unincumbered property. New money must be raised by issue of junior liens or of stock. Purchasers of junior liens require a higher rate to compensate for the less solid security, while purchasers of stock scrutinize the surplus in order to determine whether an addition to the outstanding stock will be likely to result in a decrease in the rate of dividend.

Second, the rate now demanded by investors involves a larger obligation dollar for dollar in the form of returns on the new securities sold. The railway managers face the question whether or not they can pay the interest which they would have to promise or the dividends which they would practically have to predict. It is upon their personal assurance as administrators that securities will be taken if at all. A grave doubt necessarily disturbs their minds as to future ability to pay such return. No other condition of mind is possible to them since they have no way of knowing what rates they will be permitted to charge and hence what income they will have, and no way of forecasting what draughts will be made upon their resources by Congressional and state enactments.

"OU SONT LES FLEURS D'ANTAN?"

[The following is what the one-time poet laureate of the mechanical conventions anticipated would be the result of the revision and curtailment of the entertainment features of the conventions. Whether he is a prophet as well as poet only time will tell.—Editor.]

Atlantic City days have come, the hottest of the year,
With Panamas and negligees, of talk, and baths and beer;
Sculped in the sand along the beach the "Lion of Lucerne"
Basks in the glare of southern sun and frizzles to a turn;
The "automobile party," the bust of one T. R.,
And painted adlets scattered round soon tell us where we are.

And Old Vienna's classic shades (but shades is not the word)
And "classic" should be "classy" (at least that's what I've heard);
The "closing sales" along the walk, that, lo! these many years
Have found no end of goods nor dearth of sacrificial tears;
These and the music—save the name!—that dins on every side,
Enforce the thought that Boardwalk life is at its highest tide.

And now M. M.'s and M. C. B.'s are strolling on the walk,
When not in Young's Greek Temple for annual fest of talk;
And salesman—order-taker—and industrial chevalier
Have taken up their annual stand, the Million Dollar Pier.
And roller chairs of one-coon power roll softly on the boards,

While Boniface and Bacchus' squires rake in their annual hoards.

But where the "buds," the tender "buds," that always used to come
To bloom in glory at the shore though dad was "on the bum?"
Away, like birds of last year's nest, the snows of yester year;
(Poor Daddy pays his own hotel, his fare, and—yes—his beer);
Yet may we ask in musing mood, as beach and walk we scan,
"Where are the flowers of yester year? Où sont les fleurs d'antan?"

And Daddy buys his badges, too, and pungles up the shot
For roller chairs, unless, mayhap, he'd "rather walk than not;"
He gets along without a band, a ball each week, a show;
And if he wants to take a bath, signs tell him where to go.
Bath tickets are not floating round—he knows it isn't right,
He'd better follow grandpa's plan and wait till "Sad'day night."

For Papa's conscience took a whirl, and though he likes to roam,
He's rather glad to foot the bills and be man at home;
Conventions do not last alway, and when he buys supplies
He'd rather feel his hands unbound, no bandage on his eyes.
The other fellow 'll have to cut:—"Why, Mr. S. M. P.,
Don't you recall that time last June you took a bath on me?"

And yet, I can't imagine it, it's been so—well, not so—
Since entertainments came the rage so many years ago;
I'm almost glad I am not there, I shouldn't feel at home,
And might not have the mind to do as Romans do in Rome.
And so I'll end this mingled wail and muse, as I began:—
"Where are the flowers of yester year? Où sont les fleurs d'antan?"

— F. W. LANE.

The exact situation of the railway from Kiukiang to Nanchang, the capital of Kiangsi province, China, is doubtful. The line was surveyed in 1905, but actual construction work did not commence until 1908. In April, 1910, the Chinese customs commissioner reported that the chief engineer had declared the first section of 32 miles so near completion that there was no reason why it should not have been opened that summer. At that time all the grading was finished, track had been laid for 6 miles, and most of the bridges were completed. However, financial troubles, which have interfered with the progress of the work from the beginning, set in during the summer and the work was greatly retarded. The rails and fittings for this road were manufactured by the Hanyang Iron & Steel Works at Hankow. The bridge steel, cars, locomotives, and considerable other material are from the United States. The staff, until very recently at least, was entirely Japanese. The line passes through exceptionally easy country for railway building, but involves the construction of several notable bridges, among them being a seven-span bridge about three and a half miles from Kiukiang and an 800 ft. truss bridge 50 miles from Kiukiang. The road taps an exceptionally rich country, from which great quantities of tea and other agricultural products are exported. Between comparatively low cost and prospective unusual earning power, the immediate financial success of the enterprise is expected, but the difficulty of securing the necessary capital from native sources, is likely to embarrass the management for some time.

RAILWAY SUPPLY MANUFACTURERS' ASSOCIATION.

There has been much speculation as to the usefulness of the officers and executive committee of the Railway Supply Manufacturers' Association, now that they have been interstatecommercecommissionized; but one has only to walk from the pier entrance to the Greek Temple to learn that they have hardly had time to get into very much mischief.

And as to the other features of the convention, those who know the able chairman of the respective committees in charge of the details of the supplymen's end, know that nothing has been left undone that will make for the comfort and pleasure of the members and guests of the three associations.

B. E. D. STAFFORD,
President.

On the page opposite appear likenesses of eight members of the executive committee. Two faces are missing—Lanahan and Reilly. Unfortunately some folks still have false notions about modesty when it comes to facing a camera; hence the necessity for an apology by the editor.

The president of the association is B. E. D. Stafford, general manager of the Flannery Bolt Company, Pittsburgh, Pa. "Staff" is one of the best fellows in the world and a methodically hard worker. To him, more than to any one other man, does the association owe a debt of gratitude for the success of the exhibit section. In 1910, as chairman of the exhibit committee, he gave the subject much time and attention; and last year as vice-president of the association, and again this year as its president, the respective chairmen of the exhibit committee have been helped materially by Mr. Stafford's experience and keen perception. Mr. Stafford is a practical shop man—he can lay out a shop and run the machinery; but he appears at his best as an expert on staybolts and staybolt iron. For the last 12 years he has devoted most of his time and energy to that business; and nearly eight of those 12 years have been spent in perfecting and selling the Tate bolt.

SAMUEL G. ALLEN,
Vice-President.

Samuel G. Allen, vice-president, was born at Warren, Pa., in 1870, and graduated in law from Pennsylvania State College in 1891. He practiced from that time until May, 1900, when he was made general manager of the Franklin Air Compressor Company. One year later that concern was sold to the Chicago Penumatic Tool Company and Mr. Allen and J. S. Coffin organized the Franklin Railway Supply Company, Franklin, Pa., with Mr. Coffin as president and Mr. Allen as vice-president,

E. L. ADREON.

ALBERT C. ASHTON.

W. W. ROSSER.

CHARLES P. STORRS,
Chairman, Finance Committee.

J. WILL JOHNSON,
Chairman, Exhibit Committee.

E. H. WALKER,
Chairman, Badge Committee.

LUCIAN C. BROWN.

J. R. BLAKESLEE.

GEORGE L. MORTON.

Members of the Executive Committee of the Railway Supply Manufacturers' Association.

which positions both now hold. In 1909 the company moved to New York. Mr. Allen is also secretary and treasurer of the American Arch Company, treasurer of the Locomotive Superheater Company and vice-president of the General Equipment Company, all of New York City, and secretary of the executive committee of the American Brake Shoe & Foundry Company of Mahwah, N. J.

The biographies of the treasurer, Herbert I. Lord, and secretary, John D. Conway, appeared in *The Daily*, of June 14, 1911, page 1344.

The seven geographical districts are represented on the executive committees as follows: First District (New England states and Canada), one member—Albert C. Ashton, Ashton Valve Company, Boston, Mass. Second District (New York and New Jersey), three members — Charles P. Storrs, Storrs Mica Company, Owego, N. Y.; E. H. Walker, Standard Coupler Company, New York and Lucien C. Brown, United Equipment Company, New York. Third District (Pennsylvania) two members — Frank J. Lanahan, Fort Pitt Malleable Iron Company, Pittsburgh, Pa., and George N. Riley, National Tube Company, Pittsburgh, Pa. Fourth District (Ohio, Indiana, Michigan), two members—H. I. Lord, Detroit Lubricator Company, Detroit, Mich., and J. R. Blakeslee, Ajax Manufacturing Company, Cleveland, Ohio. Fifth District (Illinois, Wisconsin, Iowa and Minnesota), Two members—W. W. Rosser, The T. H. Symington Company, Chicago, and J. Will Johnson, Pyle-National Electric Headlight Company, Chicago. Sixth District (Delaware, Maryland, District of Columbia, Virginia, West Virginia, North Carolina, South Carolina, Georgia, Florida, Alabama, Mississippi, Kentucky and Tennessee), one member—George L. Morton, Galena-Signal Oil Company, Atlanta, Ga. Seventh District (states west of the Mississippi River including Louisiana, but excepting Iowa and Minnesota), one member—E. L. Adreon, American Brake Company, St. Louis, Mo.

HERBERT I. LORD,
Treasurer.

J. D. CONWAY,
Secretary.

With each annual meeting four members of the executive committee retire and their successors are elected for three-year terms. Messrs. Adreon, Ashton, Lord and Storrs will retire at the close of this convention.

B. E. D. Stafford, president, and Samuel G. Allen, vice-president, are members ex-officio.

The several committees in charge of the details of the plans of the executive committee are made up as follows:

Entertainment Committee.

Philip J. Mitchell, (chairman), Philip S. Justice & Company, Philadelphia, Pa.; Ross F. Hayes, Curtain Supply Company, New York; W. J. Walsh, Galena-Signal Oil Company, Chicago; H. E. Oesterreich, Wendall & McDuffie Company, New York; Leonard J. Hibbard, L. J. Hibbard & Company, New York; J. C. Younglove, H. W. Johns-Manville Company, Chicago; Thomas Farmer, Jr., Consolidated Car Heating Company, New York; E. S. Toothe, Nathan Manufacturing Company, New York; Charles P. Williams, Chicago Railway Equipment Company, New York; C. A. Dunkelberg, S. F. Bowser & Company, Ft. Wayne, Ind.; Edwin H. Janes, Talmage Manufacturing Company, Cleveland, Ohio; H. A. Nealley, Joseph Dixon Crucible Company, Boston, Mass.; George R. Carr, Dearborn Drug & Chemical Company, Chicago; Herbert Green, Burton W. Mudge & Company, Chicago; C. W. Wardell, Welsbach Company, Gloucester, N. J.; L. B. Sherman, Railway Age Gazette, Chicago; William S. Furry, Ohio Injector Company, Chicago; Fred M. Nellis, Westinghouse Air Brake Company, Boston, Mass.; J. P. Landreth, Garlock Packing Company, Chicago; Harry S. Hammond, Pressed Steel Car Company, Pittsburgh, Pa; E. F. Chaffee, O. M. Edwards Company, Syracuse, N. Y.; J. D. McClintock, Wm. Sellers & Company, Inc., Philadelphia, Pa.; T. W. Illingworth, Midvale Steel Company, New York; W. K. Krepps, Crucible Steel Company of America, Pittsburgh, Pa., and Roger J. Faure, Commercial Acetylene Company, New York.

PHILIP J. MITCHELL,
Chairman, Entertainment Committee.

The sub-committees of the entertainment committee are:

Door.—In charge of entrance at all entertainments. Messrs. Williams (chairman), Green, Furry, Janes and McClintock.

M. C. B. Social Gathering and Informal Dance.—Wednesday evening, June 12, at the Marlborough-Blenheim. Messrs. Walsh (chairman), Farmer, Williams, Younglove, Furry, Green and Janes.

M. C. B. Dance.—On pier, Thursday evening, June 13, Messrs. Younglove (chairman), Hayes, Hibbard, Dunkelberg, Wardell, Sherman, Nellis, Illingworth and Krepps.

Musical Evening.—On pier, Friday, June 14. Messrs. Hibbard (chairman), Oesterreich, Toothe, Farmer, Sherman and Illingworth.

Base Ball.—Saturday afternoon, June 15. Messrs. George. W. Wildin and F. M. Nellis (managers), and Messrs. Hibbard, Hammond, Carr, Landreth and Chaffee.

M. M. Social Gathering and Informal Dance.—Monday evening, June 17, at the Marlborough-Blenheim. Messrs. Dunkelberg (chairman), Nellis, Wardell, Hayes, Carr, Sherman, Landreth and McClintock.

M. M. Dance.—On pier, Tuesday evening, June 18. Messrs. Farmer, Jr. (chairman), Toothe, Walsh, Oesterreich, Hammond, Nealley, Chaffee and Faure.

Introduction Committee.—To promote sociability at all dances. Messrs. Carr (chairman), Dunkelberg, Sherman, Nealley, Toothe, Hayes and Krepps.

Ushers' Committee.—In charge of seating of guests and distribution of programmes at entertainments and dances. Messrs.

Wardell (chairman), Younglove, Walsh, Oesterreich, Wardell, Nealley, Chaffee and Faure.

Enrollment Committee.

O. F. Ostby (chairman), Commercial Acetylene Company, New York; H. B. Darlington, Union Spring & Mfg. Company, Pittsburgh, Pa.; C. S. Woodruff, Lowe Brothers Company, Chicago; W. S. Hammond, Jr., Consolidated Car Heating Company, Chicago; M. S. Simpson, Pressed Steel Car Company Pittsburgh, Pa.; C. B. Yardley, Jr., Jenkins Brothers, New York; E. Bjerregaard, Official Railway Guide, New York; H. G. Newman, Johns-Manville Company, New York; J. G. Mowry, Patton Paint Company, New York; H. J. Jefferson, United & Globe Rubber Mfg. Company, Pittsburgh, Pa.; F. E. Beal, Magnus Metal Company, Atlanta, Ga; Simon J. Dolan, American Car & Foundry Company, St. Louis, Mo.; Harold A. Brown, Pocket List of Railroad Officials, New York; R. T. Hodgkins, Yale & Towne Mfg. Company New York and J. A. Warful, Oxweld Acetylene Company, Pittsburgh, Pa.

OSCAR F. OSTBY,
Chairman, Enrollment Committee.

Finance Committee.

Charles P. Storrs (chairman), Storrs Mica Company, Owego, N. Y.; Albert C. Ashton, Ashton Valve Company, Boston, Mass., and George N. Riley, National Tube Company, Pittsburgh, Pa.

Exhibit Committee.

J. Will Johnson (chairman), Pyle National Electric Headlight Company, Chicago; E. H. Walker, Standard Coupler Company, New York; J. R. Blakeslee, Ajax Manufacturing Company, Cleveland, Ohio, and Frank J. Lanahan, Fort Pitt Malleable Iron Company, Pittsburgh, Pa.

Badge Committee.

E. H. Walker (chairman), Standard Coupler Company, New York; Samuel G. Allen, Franklin Railway Supply Company, New York, and L. C. Brown, United Equipment Company, New York.

The result of the discrimination of the badge committee is shown herewith. The badges for the ordinary supplymen are royal blue; while those for the ladies who accompany them are white. Light-blue badges mean that the ladies who wear them are guests of members of the M. C. B. and M. M. associations. The special complimentary badges for men are red, and those for the ladies, yellow.

The holders of licenses for dealing in salt in China have decided, with government permission, to build a railway from Icheng, near the Yangtze river, to Taichow, with a branch between Icheng and the salt depot at Shiherwei, on the Yangtze river, all in the province of Kiangsu. This line will cross the Grand Canal at Kwachow and pass up the eastern bank of the canal as far as Yangchow, a good-sized city, whence it will go to Taichow via Hsiennumiao.

THE CHILLED IRON CAR WHEEL.

CHICAGO, May 31, 1912.

TO THE EDITOR OF THE RAILWAY AGE GAZETTE:

Reference to the Interstate Commerce Commission report for the year ended June 30, 1910, will show that there were 2,133,531 freight cars in service, and classification of this equipment as to capacities shows:

					Per cent.
244 013	freight cars	10,000 lbs. to	50,000 lbs.	capacity (inc.)	11.5
865 495	freight cars	60,000 lbs. to	70,000 lbs.	capacity (inc.)	40.5
641,022	freight cars	80,000 lbs. to	90,000 lbs.	capacity (inc.)	30.1
382,930	freight cars	100,000 lbs. to	110,000 lbs.	capacity (inc.)	17.9
71	freight cars	over	110,000 lbs.	capacity	....
Total, 2,133,531					100.0

The character of the equipment was as follows:

		Per cent.
966,577	box cars	45.3
153,919	flat cars	7.2
77,584	stock cars	3.6
818,689	coal cars	38.3
7,434	tank cars	.4
30,918	refrigerator cars	1.5
78,410	other cars	3.7
Total, 2,133,531		100.0

As it takes eight wheels to equip a car, it is evident that there were 17,068,248 wheels in service under freight equipment alone. Ninety-five per cent. of the wheels used under freight equipment are chilled iron wheels. Therefore, there are over 16,000,000 chilled iron car wheels in service in the United States. This figure does not include hundreds of thousands of chilled iron wheels which are used under passenger cars, locomotive tenders and on private car lines. It will thus be seen that the commerce of the country is practically dependent upon the chilled iron car wheel. The chilled iron car wheel may be defined to be a body of metal scientifically moulded in which the iron structure in every part of the wheel is admirably suited to its purpose, viz., hard tread, soft plates, soft hub.

The tread or running surface is as hard as the hardest steel, and because of this hardness it becomes polished in service, and this reduces the friction between the wheel and the rail. The plates are soft, thus insuring the necessary structure to carry heavy loads and resist temperature stresses due to brake application. The hub is soft, so that the wheel may be easily machined for axle fit. There is no known metal that possesses the graded hardness of structure of the chilled iron car wheel.

The Master Car Builders' Association specifies three classes of wheels for cars of different capacities, as follows: Six hundred and twenty-five lb. wheel for 60,000 lb. cars; 675 lb. wheel for 80,000 lb. cars and 725 lb. wheel for 100,000 lb. cars. As the capacities of the cars have increased, the wheels have been increased in weight, but not in proportion to the increase in car capacity and other parts of the car; for instance, the 625 lb. wheel carries a 60,000 lb. car and the 725 lb. wheel carries a 100,000 lb. car; the increase in car capacity has been 66⅔ per cent., and in the weight of the wheel 16 per cent. The 550 lb. axle carries a 60,000 lb. car and the 870 lb. axle carries a 100,000 lb. car.; the increase in the weight of the axle is 58 per cent. The body of the car weighs 23,000 lbs. for a 60,000 lb. car, and 32,900 lbs. for a 100,000 lb. car; the increase in the car body being 43 per cent.

It will be noted that the capacity of the car has been increased 66⅔ per cent. While the weight of the axle has increased 58 per cent., that of the car body 43 per cent., and that of the car wheel only 16 per cent., proving that the weight of the wheel has not increased in the same ratio that increases have been made in the other parts of the car.

The tendency of the railways is to increase the capacity of the car beyond 100,000 lbs., and while axles have been designed for 140,000 lb. cars, no wheel has been specified by the Master Car Builders' Association for this service. Still, the chilled iron car wheel makers are placing in service wheels to carry this load, and even loads of greater capacities. Its use under tenders of 10,000 gal. capacity and ore cars of 150,000 lb. capac-

ity proves conclusively that there is scarcely a limitation to the chilled iron wheel, and it is standard because of its safety, economy and adaptability.

As long as cars increase in capacity, all parts of the wheel should be strengthened proportionately, and in the process of evolution, from cars of 10,000 lb. to cars of 100,000 lb. capacity, metal has been added to all parts of the wheel with the exception of the flange, because of the recognized limits of track clearance.

From the earliest period of railroading the frog and guard rail clearance has been a minimum of 1¾ in., although many roads throughout the country use a minimum of 1⅞ in. and 2 in. clearance. The weight of the wheel has increased from 525 lbs. to 725 lbs., of the rail from 50 lbs. to 100 lbs., and practically the same flange is used today as was used under cars of 20,000 lb. capacity.

The important service that the chilled iron wheel is rendering is performed at a minimum cost. A chilled iron car wheel is sold in the market for an approximate differential of $3.50. The net cost to the railway is the difference between the selling price and the old wheel which is taken as part payment for the new wheel, amounting to approximately $3.50 per wheel. These wheels are guaranteed for a certain period, and in case the wheel does not give the service for which it is guaranteed, the loss comes on the manufacturer.

Under some conditions of service a 625 lb. wheel is guaranteed for six years minimum service, a 675 lb. for five years, and a 725 lb. for four years.

The average life of the various classes of wheels will approximate as follows: Twelve years for a 625 lb. ordinary freight car wheel, 10 years for a 675 lb. wheel, and 8 years for a 725 lb. wheel.

Assuming that a 625 lb. wheel only fulfills its guarantee, the cost per wheel per year, based upon the $3.50 differential, is 58⅓ cents, and the cost of 8 wheels per car is $4.66 per year. If this expense is based on the average life of 12 years for a 625 lb. wheel, the cost per car per day would be approximately $2.33.

It is stated that about 85 per cent. of the repairs to freight cars are due to shocks consequent on coupling, etc., thus damaging bolsters, draft-gears and other parts of the car. Analysis of the cost of the repairs of freight cars will show that the wheel expense is insignificant compared to the repairs for other parts of the car.

If any other wheel is substituted for the standard chilled iron wheel, it must be demonstrated by competitive tests: first, that it is more economical per ton mile; second, that it is better adapted to the service, for which it is intended, and third, that it must be safer.

Then it must be borne in mind that an added cost of $10 per wheel would involve an expenditure of $80 per car, and the interest on this investment at 5 per cent. would be $4 per car per year, which is more than the renewal cost of the standard chilled iron car wheel, and on this basis it would amount ultimately to an additional investment to the railways of $160,000,000 for freight car wheels alone.

The Association of Manufacturers of Chilled Car Wheels represents a capacity of 20,000 chilled iron car wheels per day. Its members are spending time and money investigating the important service conditions, and they are paying the most careful attention to improved foundry methods, selection of material and physical tests in order to bring their product up to the very highest standard. Statistics show that with the rapid increase in car load and capacity there has been a decrease in wheel failures. Years of experience have proved that the chilled iron car wheel will meet any condition of service no matter what load is imposed on it, and the railways receive a greater return per unit of investment from the chilled iron car wheel than from any other car wheel known.

ASSOCIATION OF MANUFACTURERS OF CHILLED CAR WHEELS.

By George W. Lyndon.

M. C. B. REGISTRATION.

Averill, E. A., American Engineer, Traymore.
Barnum, Morgan K., Ill. Cent., Dennis.
Baron, Jacob, Kentucky & Ind. Terminal, Young's.
Borrowdale, J. M., Ill. Cent., Brighton.
Boutet, H., all lines Cincinnati, Chalfonte.
Boyer, Chas. E., Penna. R. R., Runnymede.
Brazier, F. W., N. Y. C. & H. R. R. R., Marlborough-Blenheim.
Burnett, R. W., Canadian Pacific Ry., Marlborough-Blenheim.
Bussing, G. H., Buffalo & Susquehanna, New Orleans Great Northern, Haddon Hall.
Calkins, A. E., New York Central, Young's.
Caton, S. W., Western Maryland R. R., Monticello.
Chamberlain, Eugene, New York Central Lines, Marlborough-Blenheim.
Chamberlain, J. T., Young's.
Chandler, R. D., N. Y. C. & H. R. R., Lexington.
Coleman, J., Grand Trunk Ry., Dennis.
Conniff, P., B. & O. R. R., Lexington.
Copany, Alfred, Grand Trunk Ry., Young's.
Corinth, A. B., A. C. L. R. R. Co., Shelburne.
Covert, M. F., Swift Car Lines, Traymore.
Crawford, D. F., Penna. Lines, Brighton.
Crone, S. A., Dennis.
Cyr, J. W., C. B. & Q. Lines East, Traymore.
Darrach, E. H., Inter-State Car Co., Young's.
Dawson, L. L., Ft. Worth & Denv. City Ry., Brighton.
DeVoy, J. F., Chicago, Milwaukee & St. Paul Ry., Shelburne.
Dooley, W. H., Queen & Crescent, Dennis.
Downing, I. S., L. S. & M. S. Ry., Traymore.
Dunham, W. E., Chicago & Northwestern Ry., Young's.
Dunlap, W. H., Louisville & Nashville R. R., Westminister .
Everett, Ira, L. V. D. R., Dennis.
Finley, J. B., South Pacific of Mexico & Sonori Ry., Chelsea.
Flory, B. P., N. Y., Ontario & Western Ry., Marlborough-Blenheim.
Fogg, J. W., B. & O., Chgo. Ter. R. R., Chalfonte.
Forsyth, Wm., Ry. Age & Gazette, Marlborough-Blenheim.
Gaines, F. F., Central of Georgia Ry., Dennis,
Gainey, J., Queen & Crescent.
Giles, C. F., L. & N. R. R. Co., Chalfonte.
Gommerman, W. K., B. & O.
Gorrell, W. T., Phila. & Reading Ry., Monticello.
Gossett, C. E., Minneapolis & St. Louis R. R., Dennis.
Gould, Jos. E., Norfolk Southern Ry., Dennis.
Green, Herbert, Brighton.
Grieves, E. W., Galena Oil Co., Marlborough-Blenheim.
Hedgcock, E. S., L. & N. R. R. Co., Chalfonte.
Hendry, John, Grand Trunk Ry. System, Traymore.
Hennessey, J. J., C. M. & T. P. Ry., Chalfonte.
Hills, H. S., Louisville & Atlantic R. R., 11 Mt. Vernon Ave.
Hodgson, John L., Grand Trunk Ry., Traymore.
Hogsett, J. W., Am. Line Fort Worth & Dallas, Texas, Lexington.
Johnson, J. O., Southern Ry., Sterling.
Joughins, G. R., Intercolonial Ry., Chalfonte.
Kalbaugh, I. N., Coal & Coke Rv., Haddon Hall.
Kearney, A., N. & W. Ry., Shelburne.
Kellogg W. L., Pere Marquette R. R., Haddon Hall.
Kinter, D. H., Monongahela R. R., Watkins.
Lentz, John S., Lehigh Valley R. R., Dennis.
McCarthy, M. J., C. C. C. & St. L., Marlborough-Blenheim.
McCuen, J. P., C. N. & T. P. Ry., Dennis.
McFeatters, F. R., Union R. R., St. Charles.
McGrath, J. T., Chicago & Alton Rv., Marlborough-Blenheim.
McRae, J. A., Michigan Central, Chalfonte.
Miller, R. S., N. Y. C. & St. L. R. R., Marlborough-Blenheim.
Montgomery, Hugh, Bangor & Aroostook R. R., Dennis.
Parks, O. J., Penna. Lines, Traymore.
Passmore, H. E., Toledo & Ohio Central Ry., Chalfonte.
Peiffer, Charles E., Buffalo, Rochester & Pittsburgh Rv., Dennis.
Peterson, A. F., Cold Blast Trans. Co., Haddon Hall.
Portner, W. H., Q-C.
Pratt, E. W., Chgo & Northwestern Rv., Marlborough-Blenheim.
Ramage, J. C., Southern Ry., New Berkley.
Ramsdell, T. M., C. & O. Rv., Chalfonte.
Rockfellow, W. E., N. Y. C. & H. R. R. R., Pennhurst.
Rollings, E. O., L. & N. R. R., Westminister.
Russum, T. H., B. & O. R. R., Dennis.
Savanson, Chas. N., A. T. & S. F., Dennis.
Schroyer C. A., Chicago & N W. Ry., Young's.
Schultz, F. C. Chicago Car Interchange Bureau, Traymore.
Searles, E. L., B. & O. R. R., Marlborough-Blenheim.
Seddon, C. W., Duluth, Missabe & Northern Ry., Traymore.
Seidel G. W., Rock Island Lines, Traymore.
Seley, C. A., Chicago, Rock Island & Pacific Ry., Chalfonte.
Sitterly, W. H., Penna. R. R. Co., Traymore.

Smith, R D., Boston & Albany R. R., Dennis.
Smith, Willard A., The Railway Review, Dennis.
Stark, F. H., Pitts. Coal Co., Chalfonte.
Stewart, Alexander, Southern Ry., Marlborough-Blenheim.
Street, Clement F., Mechanical Engineer, Marlborough-Blenheim.
Taylor, Joe, Sec. M. C. B. Association, Marlborough-Blenheim.
Thiele, Chas. F., P. C. C. & St. L. Ry., Dennis.
Thomas, W. J., Panama Canal, 803 Atlantic Ave.
Thompson, W. O., N. Y. C. & H. R. R., Marlborough-Blenheim.
Tinker, J. H., C. & E. I. R. R., Strand.
Tollerton, W J., Rock Island Lines, Marlborough-Blenheim.
Treleaven, Thos. A., Grand Trunk Ry., Traymore.
Walsh, J. F., C. & O., Marlborough-Blenheim.
White, A. M., Colo. Midland Ry., Traymore.
Wildin, G. W., N. Y. N. H. & H. R. R., Chalfonte.
Wilson, R. D., P. & R. R. R., Monticello.
Wood, L. L., C. & E. I., Young's.
Wright, R. V., Chalfonte.
Wymer, C. J., C. & W. I. R. R. Belt Ry., Traymore.
Young, C. B., C. B. & Q. R. R. Co., Traymore
Young, C. F.

M. C. B. GUESTS.

Alexander, G. H., N. Y. C. Lines.
Allman, W. N., B. & O. R. R., Kenderton.
Beahn, Peter, Penna. R. R., Motley Dean Cottage.
Carey, W. S., Penna. Lines West, Runnell.
Clark, W. S., N. Y. C., De Ville.
Conard, G. P.
Crane, W. F., Bangor & Aroostook, Dennis.
Eddy, W. J., Rock Island R. R., Young's.
Eich, H. C., Ill. Central, Haddon Hall.
Flannagan, Harry, Great Northern Ry. Co., Dennis.
Fletcher, G. A., Traymore.
Gossett, Chas., Jr., Dennis.
Griffith, H. W., Traymore.
Hawk, R. R., Cold Blast Transportation Co., Haddon Hall.
Hayes, H. B., Ala. Great Southern, Dennis.
Hutchinson, F. E., Chicago R. & Pac. R. R., Dennis.
Lentz, George, Borton.
Litchfield, J. E., B. & O., Kenderton.
Moore, Ralph P., Duluth & Iron Range R. R. Co., Traymore.
Parker, A. McC., Marlborough-Blenheim.
Quigley, Jos., C. N. O. & T. P. Ry., Dennis.
Robertson, E. J., M. St. P. & S. S. M., Dennis.
Smith, L. K., Wabash.
Staley, P. C., Penna. R. R., Lexington.
Stears, W. C., C. H. & D., New England.
Telford, A., C. N. O. & T. P., Marlborough-Blenheim.
Telford, Master Elliott A., C. N. O. & T. P., Marlborough-Blenheim.
Thomas, Earl B., Panama, 803 Atlantic Ave.
White, F. H., Duluth, Missabe & Northern Ry., Traymore.
Yates, L. L., Pacific Fruit Express Co., Chalfonte.

THE SPECIAL TRAIN FROM CHICAGO.

The M. C. B. and M. M. special train from the West over the Pennsylvania road arrived in Atlantic City yesterday at 2.14 p. m., exactly on time. The equipment consisted of a buffet car, two dining cars and 12 Pullman sleeping cars. The train was in charge of E. K. Bixby, district passenger agent of the Pennsylvania Lines at Chicago. All on board enjoyed the trip. Among the passengers were the following: 235—

J. J. Acker, General Car Foreman C. R. I. & P., Horton, Kan.; W. L. Allison, Franklin Railway Supply Company, Chicago; Hugh S. Adams, Chicago; F. R. Angell, National Malleable Castings Company, Chicago; H. P. Bayley, Pyle-National Electric Headlight Company, Chicago; L. W. Barker, Locomotive Improvement Company, Clinton, Iowa; W. E. Ballentine, Willard Storage Battery Company, Chicago; M. K. Barnum, General Superintendent Motive Power I. C. R. R., Chicago; T. Broom Belfield, Philadelphia; R. L. Brown, National Block Washer Company, Chicago; C. L. Brown, Manning-Maxwell & Moore, Chicago; Geo. H. Bryant, Thomas Prosser & Son, Chicago; W. M. Boughton, Chicago; W. L. Bean, Jacobs-Shupert Company, San Francisco; M. C. Beymer, American Arch Company, Chicago; W. A. Bennett, Griffin Wheel Company, Chicago; J. M. Borrowdale, Superintendent Car Department I. C. R. R., Chicago; W. W. Breckenridge, Mechanical Expert, Galena-Signal Oil Co., Duluth, Minn.; M. F. Covert, Swift Refrigerator Transportation Company, Chicago; W. H. C. Carhart, Illinois Steel Company, Chicago; Mrs. W. H. C. Carhart, Chicago; J. W. Cyr, Superintendent Motive Power, C., B. & Q. R. R., Chicago; Miss Florence Caird, National Boiler Washing Company, Chicago; J. F. Comee, Camel Company, Chicago; E. E. Cook, Railway Journal, Chicago; Geo. R. Carr, Dearborn Drug & Chemical Works, Chicago; R. P. Cooley, Chicago Car Heating Company, Chicago; Geo. T. Cooke, Chicago Car Heating Company, Atlanta; Geo. Condon, A. T. & S. F. Ry., Topeka, Kan.; J. F. DeVoy, Assistant Superintendent M. P., C. M. & St. P., Milwaukee, Wis.; P. J. Duffy, Carpen Appliance Exhibit Building, Chicago; H. E. Daniels, West Disinfecting Company, Chicago; Chas. W. Dake, Consulting Engineer, Chicago; W. E. Dunham, Supervisor M. P. & M. C. & N. W. Ry., Winona, Minn.; W. W. Darrides, Camel Company, Chicago; F. T. De Long, Chicago Railway Equipment Company, Chicago; J. J. Dale, Celfor Tool Company, Chicago; L. L. Dawson, Superintendent Motive Power, Childress, Tex.; W. J. Eddy, Inspector Tools and Machinery, C. R. I. & P., Chicago; Fred. M. Egolf, Curtain Supply Company, Chicago; P. M. Elliott, Camel Company, Chicago; Mrs. P. M. Elliott, Chicago; Henry C. Eich, Master Mechanic I. C., Burnside, Ill.; Harry F. Finney, Independent Pneumatic Tool Company, Chicago; P. J. Ford, Crerar-Adams & Company, Chicago; Mrs. P. J. Ford, Chicago; Harry Flannagan, Great Northern, St. Paul, Minn.; Frank W. Furry, Ohio Injector Company, Chicago; William S. Furry, Ohio Injector Company, Chicago; Chas. Gaspar, National Malleable Castings Company, Chicago; T. P. Gaskins, Gilford S. Wood, Chicago; C. E. Gossett, General Master Mechanic, Cedar Lake Shops, Minneapolis, Minn.; A. S. Goble, Baldwin Locomotive Works, Chicago; E. H. Gold, Chicago Car Heating Company, Chicago; C. A. Hardy, Crane & Foundry Equipment Company, Chicago; P. B. Harrison, Chicago Railway Equipment Company, Chicago; Oscar C. Hayward, Tousey Varnish Company, Chicago; R. R. Hawk, C. B. T. Company, Chicago; J. W. Hathaway, Union Draft Gear Company, Chicago; J. J. Hennessy, M. C. B., C. M. & St. P., Milwaukee; E. R. Hibbard, Grip Nut Company, Chicago; E. W. Hodgkins, Chicago; Lee P. Hynes, Railway Utility Company, Chicago; P. C. Jacobs, H. W. Johns-Manville Company, Chicago; Emery E. Jett, M. C. B., Morris & Co., U. S. Yards, Chicago; Frank J. Johnson, Car Manufacturers, Chicago; L. F. Jordan, The Texas Company, Chicago; W. L. Kellogg, Superintendent M. P. Pere Marquette, Detroit, Mich.; Henry H. Kerr, Westinghouse, Church, Kerr & Company, Chicago; J. H. Kuhns, Republic Rubber Company, Chicago; E. B. Leigh, Chicago Railway Equipment Company, Chicago; Edwin F. Leigh, Chicago Railway Equipment Company, Chicago; John M. Lammedee, Railway & Engineering Review, Chicago; A. V. Manchester, Galena-Signal Oil Company, St. Paul; R. S. Mitchell, International Correspondence Schools, Chicago; W. N. Mitchell, International Correspondence Schools, Chicago; J. D. Murray, Mining Phosphate, Christmas Island; W. E. Magraw, The Railway List Company, Chicago; O. W. Middleton, Railway Master Mechanic, Chicago; W. S. Mellen, Heath & Milligan Manufacturing Company, Chicago; J. L. McGrath, Superintendent Rolling Stock C. & A., Bloomington, Ill.; Geo. McDonald, Dist. Car Inspector, C. R. I. & P., Kansas City, Kan.; Thomas O'Malley, O'Malley-Beare Valve Company, Chicago; Edward O'Malley, O'Malley-Beare Valve Company, Chicago; Ralph P. Moore, Purchasing Agent Duluth & Iron Range, Duluth, Minn.; C. J. Nash, Universal Draft Gear Attachment Company, Chicago; Wm. J. Pine, Railway Utility Company, Chicago; E. W. Pratt, Assistant Superintendent M. P. & Machinery, C. & N. W., Chicago; Mrs. E. W. Pratt, Chicago; B. Pratt, New York Air Brake Company, Chicago; L. R. Phillips, Nat'l Tube Company, Chicago; Mrs. L. R. Phillips, Chicago; Geo. H. Porter, Western Elec. Company, Chicago; J. D. Purcell, Dearborn Drug & Chem. Works, Chicago; F. H. Quail, Karpen Appliances Exhibit Bldg., Chicago; N. F. Rehm, Railway Supply Index-Catalogue, Chicago; J. T. Ross, Adams & West-

lake Company, Chicago; John J. Ross, U. S. Metal & Manufacturing Company, Chicago; E. J. Robertson, Superintendent Car Department, Minneapolis; Mrs. E. J. Robertson, Minneapolis; Harold A. Smith, Railway & Engineering Review, Chicago; Willard A. Smith, The Railway Review, Chicago; F. B. Smith, Bullard Machine Tool Company, Chicago; H. N. Scott, Griffin Wheel Company, Chicago; C. W. Seddon, Superintendent Motive Power and Cars, D. M. & N., Proctor, Minn.; F. C. Schultz, Chief Interchange Inspector, Chicago; Robert T. Scott, Independent Pneumatic Tool Company, Chicago; W. T. Sears, M. M., C. H. & D., Indianapolis; Edward C. Schmidt, University of Illinois, Urbana, Ill.; W. T. Simpson, S. F. Bowser & Company, Chicago; C. A. Seley, Master Mechanic, C. R. I. & P., Chicago; W. J. Schlachs, McCord & Company, Chicago; W. E. Sharp, Grip Nut Company, Chicago; Charles N. Swanson, Superintendent Car Shops, A. P. & S. F., Topeka, Kan.; John Tonge, Hotel Dennis, Minneapolis; H. A. Varney, National Boiler Washing Company, Chicago; E. V. Van Patten, Murphy Varnish Company, Chicago; G. N. Van Sweringen, Chicago Railway Equipment Company, Chicago; Arthur Wyman, Chicago Railway Equipment Company, Chicago; Mrs. Arthur Wyman, Chicago; D. O. Ward, Clinch Nut Company, Chicago; A. M. White, Foreman Car Department, Colorado City, Colo.; Ed. Wilhelm, Boss Nut Company, Chicago; Edward Wray, Railway Electric Engineer, Chicago; W. White, National Boiler Washing Company, Chicago; Mrs. W. White, Chicago; Charles J. Wymer, General Car Foreman Belt Railway, Chicago; W. G. Willcoxson, Grip Nut Company, Chicago; Harry S. Whitehair, McCord & Company, Chicago, A. C. Woods, Union Spring & Manufacturing Company, Chicago, F. H. White, Purchasing Agent, D. M. & N., Duluth, Minn.; L. L. Yates, Superintendent Car Department, P. F. E. Company, Los Angeles, Cal.; C. B. Young, Mechanical Engineer, C., B. & Q., Chicago; Mrs. C. B. Young, Chicago.

During 1910 more or less complete surveys were made for the line from Sinyang, on the Peking-Hankow line in the southern portion of Honan province, China, to Fungyang, one of the principal points on the Tientsin line in Anhwei province. This line is projected by the board of communications at Peking, but no announcement has been made as to when the work will be pushed to completion. No work has been done, other than surveys.

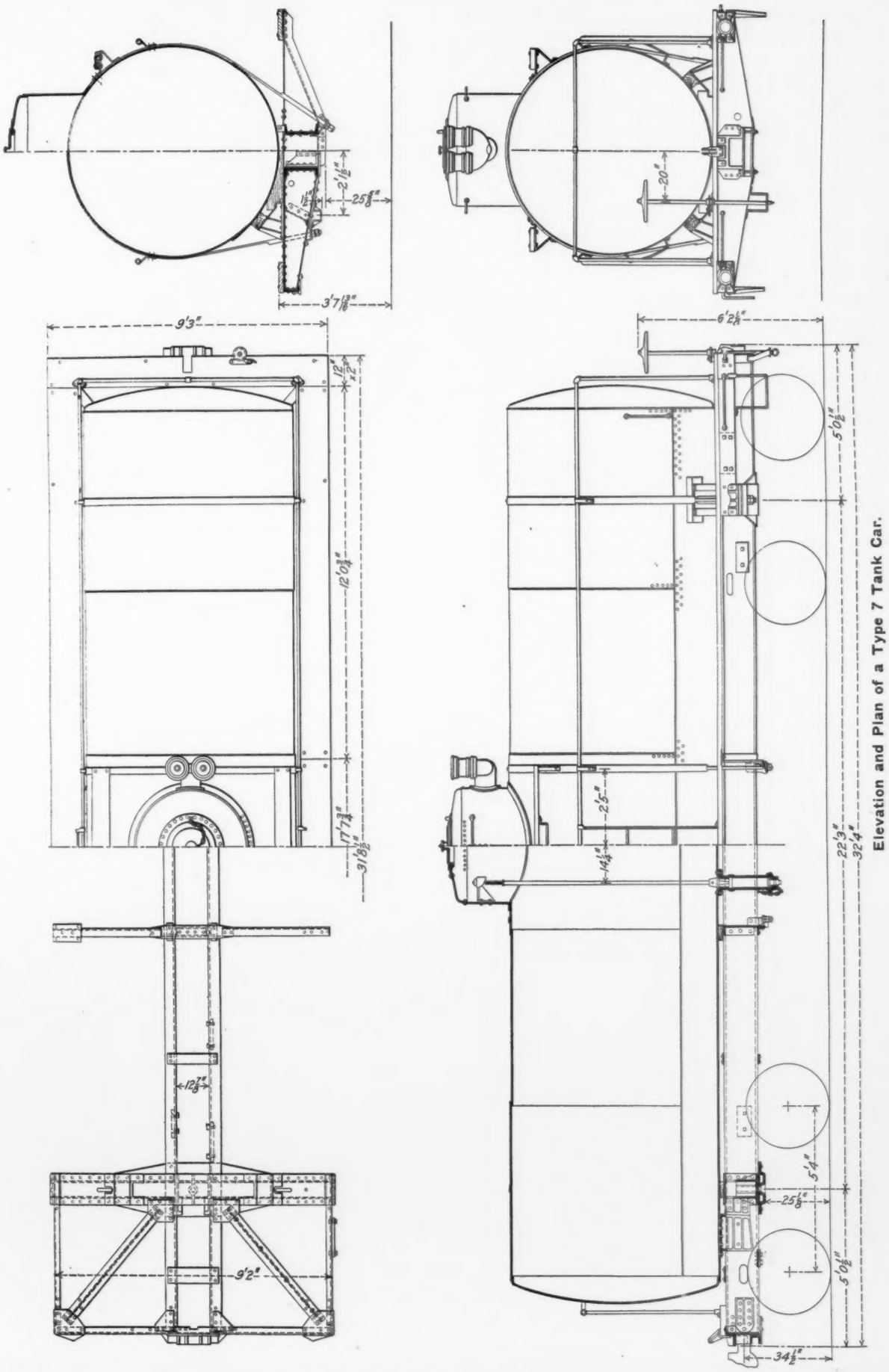
STEEL UNDERFRAME TANK CAR.

The American Car & Foundry Company, New York, has recently made some new designs of steel underframe tank cars, which are called the type 7 tank cars. These cars are designed to meet the present requirements of the M. C. B. Association, as well as of the Interstate Commerce Commission. The special feature is that of the tank anchor blocks, which are of cast steel and are riveted to the tank immediately ahead of the bolster, fitting tightly between an extension of the cast steel bolster center filler and the back of the friction block of the draft gear. In this way the tank is prevented from shifting and the expansion of the tank and underframe are duly allowed for. With this construction the buffing strains are considerably reduced.

The cars are equipped with the standard friction type of draft gear and the drawbar pull is nearly on a line with the center line of the center sills. The end platforms consist of 2-in. x 2-in. southern pine plank bolted to the sills. Low runways of southern pine are placed on each side of the car, securely bolted to the runway braces, the body bolsters and the side sills. They are provided with a ¾-in. iron pipe hand rail extending entirely around the tank. The dome may be reached on each side of the car by a ladder which extends from the runway to the hand rail, immediately above which is a dome step supported by brackets riveted to the tank bands.

The underframe is the American Car & Foundry standard and consists of 6-in. channel side sills extending from the end sill to the bolster. The center sill is made of two 13-in. steel channels, each having a sectional area of 15 sq. in. and extend the full length of car, being tied together between the bolster and the center of the car by ½-in. top and bottom tie plates. In addition to these tie plates the center sill channels are tied together and stiffened by two cross bearers which act as the running board supports. They consist of top and bottom members passing respectively over and under

Type 7 Tank Car.



Elevation and Plan of a Type 7 Tank Car.

the center sill with pressed steel diaphragms fitting in between them. The end sills are 5-16 in. pressed diaphragms connected to the side sills by malleable iron push pole pockets and to the center sill by cast steel striking plates, pressed steel knees and gussets. The body bolster consists of two ⅜-in. pressed steel web plates which are reinforced on the top by a 12-in. x ½-in. plate and on the bottom by a 20½-in. x ⅜-in. plate. The center plates are cast steel and are riveted to the bolster. Forged side bearings are bolted to the bolster so that the clearance may be adjusted and are reinforced at this point by forged struts extending up between the webs of the bolster. On top of the bolster and riveted to the cover plate and flange of the web is placed a malleable iron cradle to which are bolted the oak liner blocks that support the tank.

The car is equipped with automatic freight car air and hand brakes. They are mounted on standard freight car trucks and have an unusually low center of gravity. The American Car & Foundry Company is prepared to furnish tank cars of this type of from 6,000 to 12,500 gallons and of 6,000, 8,000 and 10,000 lbs. capacity.

THE NEW YORK SPECIAL TRAIN.

A special train on the Central of New Jersey brought a party for the conventions from New York City yesterday afternoon. The train consisted of a baggage car and four parlor cars. It left New York at 3.40 p. m. and arrived in Atlantic City at 6.45 p. m. Among those who came on it were the following:

Fred Atwater, Columbia Nut & Bolt Company; Henry Bartlett, M. S., Boston & Maine; W. M. Perrine, wife and son, M. M., C. R. R. of N. J.; W. A. Best; H. F. Birkel, New York Air Brake Company; Geo. L. Bourne and wife, Locomotive Superheater Company; E. G. Buchanan, Carbon Steel Company; J. H. Burwell; F. W. Chaffee and wife, General Car Inspector, N. Y. C. & H. R.; C. E. Chambers, wife and daughter, S. M. P., C. R. R. of N. J.; J. S. Chambers and wife, S. M. P., A. C. L.; J. H. Clark, wife and daughter, S. M. P., Staten Island Rapid Transit; G. G. Davis, General Foreman Car Department, C. C. C. & St. L.; W. Eckels, Standard Coupler Company; R. D. Gallagher, Jr., Standard Coupler Company; Wm. J. Grinden, Grinden Art Metal Company; W. H. Hall, Chief Inspector, C. R. R. of N. J.; Karl A. Heine, Pittsburgh Spring & Steel Company; Wm. T. Henry, New York Air Brake Company; L. J. Hibbard, R. B. Steele, R. P. Orcutt, Churchhill Clark, C. Truesdale, L. J. Hibbard Company; John M. High, Pantasote Company; S. Hoffman and wife, Locomotive Superheater Company; D. P. Lamoreux, Beaver Dam Malleable Iron Company; J. W. Marden and wife, Superintendent Car Department (retired); B. & M.; P. P. Mirtz and wife, Mechanical Engineer, L. S. & M. S. Ry.; O. H. Morgan, Chicago Varnish Company; John P. Neff and wife, American Arch Company; Fred. L. Olds, Chicago Varnish Company; O. H. Reynolds, wife and sister, Wm. Jessop & Sons; George W. Rink and wife, Mechanical Engineer, C. R. R. of N. J.; E. J. Ronan, Gold Car Heating & Lighting Company; E. T. Sawyer, Commercial Acetylene Company; F. H. Smith, Gold Car Heating & Lighting Company; Harry D. Vought and wife, Miss Mary Evelyn Dorrler, Secretary N. Y. R. R. Club; R. H. Weatherly and wife, The Pilliod Company; F. M. Whyte, New York Air Brake Company.

PRESSURE ON JOURNAL-BEARING WEDGES.

To the Editor of the Daily Railway Age Gazette:

The accompanying table, prepared in our office, illustrates the effect of different widths of wedges in different sizes of journal boxes.

The wedge, due to its crowned surface, has theoretically, a line contact with the ceiling of the box, which makes necessary a comparison of the load per lineal inch width of the wedge.

You will note there is 1600 lbs. per lineal inch on the 20-ton wedge, which is 4.5 in. wide, and 2115 lbs. on the 30-ton wedge, which is 4.875 in. wide. If the width of the 30-ton wedge is correct for that load, the 20-ton wedge should be 3.41 in. wide instead of 4.5 in.; or, if the width of the 20-ton wedge is correct, the width of the 30-ton wedge should be 6.45 in. Again there is 2450 lbs. per lineal inch on the 40-ton wedge, which is 5.625 in. wide. Assuming this to be correct, the 30-ton wedge instead of being 4.875 in. wide would have to be 4.2 in. wide, and the 20-ton would have to be 2.94 in. wide instead of 4.5 in, or if the 20-ton wedge is correct, the 40-ton wedge would have to be 8.63 in. wide, and if the 30-ton wedge is correct, the 40-ton wedge would have to be 6.54 in. wide. In each case the widths of the wedges used, are underlined, the 20, 30, 40 and 50 tons being M. C. B. standard capacities. The three different widths of wedges of the 70-ton are various designs now being used.

The point we wish to bring out is that the load has been increased from 1600 lbs. to 3398 lbs. per lineal inch on wedges. There has been considerable trouble with the 50-ton wedges, with a load of 2800 lbs. per lineal inch, seating in the top of the boxes. In fact, one railway has gone to the extreme of attempting to put a steel insert at this point in grey iron boxes to increase the length of time the wedges in 5½ in. x 10

Cap. Car Tons	Weight of Car Less Wheels & Axles	Weight on Journal Car Loaded	Size Journal	Dimensions of Brass in Contact	Projected Area Brass Sq. In.	Load Per Sq. In. on Brass	Width of Wedge	Load Per Lineal Inch on Wedge	WIDTH OF WEDGES						
									20-Ton	30-Ton	40-Ton	50-Ton	70-Ton		
													B. & O Penn	Harriman	McCord Std.
20	17600	7200	3¾" x 7"	3¾" x 6¼"	20	360	4.5"	1600	4.5"	3.41"	2.94"	2.57"	2.18"	2.14"	2.72"
30	22400	10300	4¼" x 8"	3½" x 6⅞"	24	429	4.875"	2115	6.45"	4.875"	4.2"	3.68"	3.26"	3.03"	3.89"
40	30400	13800	5" x 9"	4" x 7⅞"	31½"	438	5.625"	2450	8.63"	6.54"	5.625"	4.94"	4.37"	4.06"	5.21"
50	36800	17100	5½" x 10"	4½" x 8⅞"	40	427	6.125"	2800	10.7"	8.1"	6.98"	6.125"	5.41"	5.03"	6.46"
70	40000	22500	B. & O.-Penn. 6" x 11"	5" x 9⅞"	49½	455	7.125"	3157	14.06"	10.63	9.2"	8.03"	7.125"	6.625"	8.500"
70	40000	22500	Harriman 6" x 11"	5" x 9⅞"	49½	455	6.625"	3398	14.06"	10.63"	9.2"	8.03"	7.125"	6.625"	8.500"
70	40000	22500	McCord Std. 6" x 11"	5" x 9⅞"	49½	455	8.500"	2647	14.06"	10.63"	9.2"	8.03"	7.125"	6.625"	8.500"

Note—Underlined figures show present M. C. B. width of wedge, and widths of wedges shown in same column indicate what the width would be if same proportionate bearing were given to the other sizes.

in. boxes are adjustable. We have never heard of any wedges seating trouble in the 40-ton boxes, from which it is fair to assume that some place between the loading per lineal inch of the 40- and 50-ton boxes should be determined on and that loading used on journal boxes of future design.

You will note, if we assume the 40-ton wedge is correctly loaded, the wedge in 6 in. x 11 in. boxes would have to be 9.2 in. wide instead of 6.625 in. and 7.125 in. as in the two present designs. We have assumed a load of 2647 lbs. per lineal inch in designing the wedge 8.5 in. wide.

McCord & Company.

FOREIGN RAILWAY NOTES.

Of the 5,404 miles of railway actually in operation in China, 2,433 miles are in what may be termed the Manchurian division. About two-thirds of the roads operated are Japanese and Russian. In this portion of China, railway construction has been hastened in recent years for a number of reasons. The general aspect of the railway situation in Manchuria has changed comparatively little in the past year. The Kirin-Hoiryong line was held in abeyance until the completion of the Kirin-Changchun line. During 1910 work was continued with little interruption, and on the whole it has been successful. The line is constructed by Chinese and Japanese interests, each furnishing half the capital; but the railway will have comparatively little traffic until the Hoiryong extension via Kirin and Omoso to the Chientao district and the banks of the Tumen is built. A branch line will run from there to the port of Hungchun, and Japanese owners of connecting lines plan to connect with their harbor of Chyongjin in northern Korea. During 1910 surveys of the Kalgan-Suiyuan-Kweihuangcheng line were made under the direction of the Chinese government and work is being carried on rapidly. The railway is to open up a part of China now practically unknown to the outside world. It is promised that the road will be running as far as Tienchen this summer. It is planned to extend the line to Urga and Kiahtka and it may therefore form a link between Peking and the Trans-Siberian railway, which will reduce the transit period between Europe and the Chinese capital by about two days.

The construction of small lines and connectors of the larger lines in the central portion of China seems to be almost entirely suspended. The reason in almost every case appears to be a lack of funds on the part of the Chinese promoters and an unwillingness to place loans abroad. Thus, in the case of the proposed line from Nanking or Wuhu to the sea at Ningpo by way of Hangchow, a company was formed at Wuhu some years ago with the title Anhwei Railway Company, for the purpose of constructing a line from Wuhu to the town of Kwangtechou, near the frontier of Chekiang province. Work was commenced in 1906. Up to date all that has been accomplished is the construction of the embankment as far as the village of Wanchih, some 30 miles from Wuhu, and the construction of two or three single-track bridges in that section. The site of the future terminus, on the foreign settlement at Wuhu, has not even been filled in. A few trolley lines and dumping wagons, with some piles of sleepers, are the only indication that railway construction is, or has been, in progress. No machinery, rolling stock, or other requisites of a railway have been imported, and so far as known, none has been ordered. The progress made in 1910 is represented by the dumping of several thousand cubic yards of filling on the site of the terminus at Wuhu. As regards the future, more activity is promised, owing to the return to China of Lord Li Ching-fang, formerly Chinese minister in London. Lord Li was one of the original promoters of this line.

Conventionalities.

"Bureau of Information" sounds good; but where, oh where can it be?

The dynamometer car used in making all of the tests was in charge of Isaac Simpson.

J. P. McCuen, former superintendent of motive power of the Queen & Crescent, is in Atlantic City renewing friendships among many of his former co-workers.

The familiar and always welcomed presence of Franklin P. Stoy, for many years mayor of Atlantic City, will be missed this year. Mayor Stoy passed away July 22, 1911.

We are dee-lighted to see that prince of industry, A. C. Moore, general manager of the Safety Car Heating & Lighting Company. Mr. Moore looks well and natty, as usual.

J. A. Middleton, vice-president of the Lehigh Valley in charge of operation, is at the Marlborough-Blenheim with his family. He expects to go back to New York on Saturday.

William Miller, who was to have served on the entertainment committee, found at the last moment that, owing to the pressure of business, he would be unable to attend the conventions this year.

Beau Brummel and his artistic successors have all got to take their hats off to Frank T. Hyndman, of oil storage fame. The Nile green tie with amethyst cross bars which he affects is the last sartorial word.

One of the early callers at the office of *The Daily* was Stephen C. Mason, of the McConway & Torley Company. In his haste to get away, however, he forgot to leave a cigar for the editor.

Mr. and Mrs. Robert Alter arrived on Sunday evening and are stopping at the Hotel Dennis. Mr. Alter is connected with the American Tool Works and has recently been given charge of the export business, with the title of European manager.

Among the first to get here were Mr. and Mrs. D. C. Noble. As usual, they are staying at the Marlborough-Blenheim. Mr. Noble was recently confined to his home for some weeks by a severe attack of bronchitis; but no one would suspect it to look at him now.

One of those who will be missed by visitors to the office of *The Daily* is John N. Reynolds, western manager. In point of years of attendance at these annual gatherings, Mr. Reynolds is one of the "old guard." This would have made his thirty-seventh year.

Once again it is our pleasure to record Scott Blewett as among the first to arrive. Mrs. Blewett is with him and they are staying at the Marlborough-Blenheim. The glad hand as extended by Mr. Blewett certainly makes one feel that life is well worth living.

H. S. Hayden, who, with Mrs. Hayden, is staying at Chalfonte, has not led quite as strenuous a life during the last year as has his co-worker, Mr. Evans; but he, too, has resolved to devote some of his time to enjoying the air and pleasures that Atlantic City and the convention afford.

The year 1911 chronicled the death of Fred. A. Casey, of the Ashton Valve Company. Mr. Casey was the efficient chairman of the executive committee of the railway supply men for the conventions of 1900-01. Many of those who attend the conventions this year will speak in loving memory of genial Fred Casey.

Hats off! to Albert Waycot. He surely must have been a popular officer of the Supply Men's Association; for

according to the official program of entertainment and general information booklet, Mr. Waycot was president of the Supply organization "1889-1900," a period of eleven years.

Through the process of elimination, often practiced at political and other conventions, Heap Big Chief Johnson was deposed as head of the entertainment committee. But you can't down Johnson. He has reappeared this year in a dual capacity—a member of the executive committee and chairman of the exhibit committee.

J. Alexander Brown tried to force an entrance to the pier on Tuesday morning by flashing a badge that he wore at the International Railway Congress in Switzerland in 1910. It didn't work, however, because the doorman mistook the badge for an advertising dodge of a concern that makes adhesive plaster and kindred articles.

One of the early arrivals, and a welcome one, was E. S. Hedgcock, a member of both associations. Mr. Hedgcock is assistant to the superintendent of machinery of the Louisville & Nashville, at Louisville. Mrs. Hedgcock and daughter, Miss Mary Hedgcock, are with Mr. Hedgcock. They are stopping at the Chalfonte.

J. W. Fogg, master mechanic of the B. & O., Chicago Terminal, arrived Sunday in advance of even the "advance guard" of railway men. He was accompanied by Mrs. Fogg and is stopping at the Chalfonte. Mr. Fogg says he does not relish the separation, even for a short time, from his little daughter, who was born just before the convention last year.

W. F. Walsh, air brake inspector of the Chespeake & Ohio, will attnd the meeting of the Master Mechanics' Association. Mr. Walsh has been in charge of the extensive series of tests that have been made with the new locomotives of the Mallet, Mountain and Mikado types, which have given such splendid results in sustained capacity.

Mr. and Mrs. J. F. Deems arrived at the Marlborough-Blenheim on Monday afternoon. They motored down from New York. Mr. Deems was president of the Master Mechanics' Association in 1906, but this year, as president of the Ward Equipment Company, he again appears in the ranks of the supply-men, after an interval of ten years. His appearance clearly indicates that he finds his new work very agreeable.

A. Stewart, president of the Master Car Builders' Association and general superintendent motive power and equipment of the Southern Railway, reports a busy year on that road. The peach crop, which was practically a failure last year, promises to be exceptionally heavy this year. It will be necessary to move it within the next six weeks or two months, so that there will be a more or less heavy tax on the equipment during that period.

Ambrose Swasey, of The Warner & Swasey Company, with Mrs. Swasey, is staying at the Marlborough-Blenheim. Mr. Swasey entertained the members and guests of the American Society of Mechanical Engineers at dinner at the Union Club, Cleveland, on Thursday evening of last week. He will leave Atlantic City on Monday to attend a meeting of the nominating committee of the American Society of Mechanical Engineers in New York.

Our care-free friend, Harry W. Finnell, report says, is an entrant for national golf honors in the amateur championship to be held this summer on the Wheaton links, at Chicago. His many friends hope he will be among the leaders when the final scores are announced. And well may their expectations be attained to the highest pitch; for Harry, in recent practice, drove a golf ball so far and so true that friction has arisen between the United States army and navy, the navy wanting him as a dreadnaught and the army for a coast defense.

C. A. Schroyer, superintendent car department of the Chicago & Northwestern, appeared at the registration desk bright and early yesterday and was granted a special dispensation in order that he might have the privilege of paying his dollar and getting his button. Some delay was experienced in getting the secretary's records from the express office; and, except in the case of a few of the notables, such as Mr. Schroyer, the opening of the registration of railway men was delayed.

"Meet Me at the Fountain" may (?) prove a popular phrase on the pier this year, provided the management will live up to the efforts of the artist who sketched the "ice water" sign over the new sanitary dispensary of liquid refreshments. Just now its temperature, together with its proximity to the fish tanks, are apt to make one suspicious of its source. However, sanitation is sure desirable at any cost; so don't get peeved if you get your nose wet when first you try, but cultivate the art of sipping gracefully from the crest of the sparkling bubble.

J. F. Walsh, general superintendent of motive power of the Chesapeake & Ohio, arrived on Monday, accompanied by Mrs. Walsh and Miss Mary Walsh. They are stopping at the Marlborough-Blenheim. Mr. Walsh has a Mikado type locomotive which he is willing to match against all comers. It is hauling trains of 110 and 112 cars weighing 7,740 tons at speeds up to 15 miles an hour on 0.3 per cent. grades. If anyone has a non-articulated locomotive that is doing better than this in freight service, or better than the mountain type in passenger service, Mr. Walsh would be glad to compare notes with him.

Mr. and Mrs. R. J. Evans are staying at Chalfonte. It is Mr. Evans' idea to dilute business with a liberal percentage of pleasure. During the last year and a half Mr. Evans has had two narrow escapes from death. The first was an accident to his automobile on the road between Franklin, Pa., and Chautauqua, N. Y., when he was thrown out and injured severely. In the other accident he was thrown from a railway inspection car and badly bruised and cut on the face and head. To prove his staying qualities, he fooled everyone by getting well; and by way of diversion he planned and supervised the building of a new asbestos plant.

Charles F. Giles, superintendent of machinery of the Louisville & Nashville, Louisville, Ky., who has not attended the conventions since the gatherings at Lakewood, New York, in 1893, arrived Tuesday and registered at the Chalfonte. He is accompanied by Mrs. Giles and daughter, Miss Margaret Giles. These are the first M. C. B. and M. M. conventions attended by Mrs. Giles and Miss Giles. Mr. Giles is a member of both the M. C. B. and M. M. Associations and his presence at the meetings will be very welcome. Five Pacific type locomotives, designed and built at the Louisville shops under Mr. Giles' direction, have recently been placed in service. These locomotives are equipped with superheaters and brick arches and are being used on the heavy high-speed passenger trains with exceptionally good results. The Louisville & Nashville is building at its own shops all of its motive power and rolling stock, including the steel underframes for passenger coaches.

"Mine Host" Albert T. Bell, of Chalfonte, well known to conventionites, and who labored successfully with other prominent business men of Atlantic City to bring the M. C. B. and M. M. gatherings here in 1906 and subsequent years, has had two eventful experiences during the past year. On July 5 he occupied the passenger's seat with aviator Harry Atwood in an aeroplane flight along the ocean-front of Atlantic City. It was a most successful flight in spite of a twenty-five mile wind. In making the landing on the beach opposite the Brighton Casino the large audience was thrilled by witnessing a five-hundred foot volplane of the machine to a safe landing at the water's edge. "Mine Host" Charles D. White, of the Marlborough-Blenheim, shared also in the honors of the day by making a

flight with birdman Atwood. Mr. Bell's other experience was his taking a leading part in the rescue from the ocean off Atlantic City of Melvin Vaniman and crew in the dirigible airship "Akron."

David Holtz, for more than 30 years master of machinery of the Western Maryland, was for many years a familiar figure at these conventions. His death on May 30 last was not wholly unexpected, because he had been seriously ill for some weeks; but the end was sudden. He was bright and hopeful to the last, and had been looking forward to again meeting his old associates. Mr. Holtz was made of the kind of timber that was used to build the foundation of this country. He was well educated, and worked his way up from the bottom. At the outbreak of the civil war Mr. Holtz enlisted in the Union Navy as a marine engineer and served under Admiral Farragut through the four years' conflict. He took part in the battle of Mobile Bay and the siege of Fort Fisher. Physically, Mr. Holtz was slight and wiry; but his mind was broad and his disposition sweet and retired. His home life was a model for simplicity and happiness and those of us who were privileged to know his wife and daughters will at once recall the happy group of four who enjoyed every minute of their time at these annual gatherings. The two Misses Holtz and a son survive.

Toil has its compensations. Some of them are unique. A. W. Whitford got on the ground early last week with his two accordion-pleated baby fireboxes and proceeded to pose them. One of the boxes tips the beam at eight tons and the other at ten. No wonder, then, that A. W. exhibited external signs of nervousness when, at the fag end of a day, he put a jack under his favorite, the ten-tonner, and after working the lever a number of times noticed that the firebox didn't "hist." A few more strokes at the lever and it was observed from a perspective inspection that the floor had become sway backed. At four o'clock the following morning Contractor Lane found Whitford under the pier with one arm over a stringer and the rest of his anatomy coiled around a steel pile, assiduously examining the accordion pleats on the underside of the flooring. After some questioning it was learned that the early visit, all alone, was planned with the deliberation to learn whether a wireless "firebox at the bottom of the Atlantic" would have to be sent home if that jack handle was given another pull. Right here Conway emerged from behind another pile and a consultation followed. The result was that all three went above and, after some modifications of *modus operandi*, the obstreperous boiler plate was positioned. To add to the difficulty of the work, it was necessary to install the exhibit on a slanting floor and the finished effect is a little off perpendicular. It would be the "unkindest cut" if someone unacquainted with all these facts noticed aloud in the presence of the erectors that the front end seemed to have settled a little. We trust this publicity will restrain any such words.

The Chinese government, under the administration of Tang Shao Yi in the railway and communications department, planned a complete system of railways, connecting the various commercial centers of the empire. This plan included the construction of one or more railways from the present Peking railway system to connect with the Trans-Siberian railway near Lake Baikal or farther west, and thus cut off about two days in the journey from Europe to Peking and points south; a railway into Mongolia, another into Tibet, and still another into Kokonor. Tang Shao Yi urged the construction of the system across Shansi and Shensi, the system parallel to the Yangtze river, the connection between the Yangtze and Yunnan rivers, the Canton-Hankow line. Though these railways are still a matter of the future, it is highly probable that they will be built as quickly as circumstances will permit.

The Exhibit.

The Parkesburg Iron Company, Parkesburg, Pa., is erecting an addition, 175 ft. long, to its tube mill building, making the total dimensions 85 ft. x 800 ft. This enlargement was necessary to enable the furnaces to operate at full capacity.

The Pilliod Company, New York, last January increased the capacity of its works at Swanton, Ohio, so that, although it could previously only make 15 gears a month by working full time, in April it was able to ship 68 gears by working 13 hours a day, and in May, 65 gears. Plans are now under way to double the present capacity.

The Storrs Mica Company, Owego, N. Y., in addition to its mica headlight chimneys and lantern globes, is showing a new type of hose clamp, which is made in two pieces and is therefore easily removed from old hose without damage. This clamp is capable of repeated use, and it is claimed that a decided economy results from its use. The Storrs company has been made the general sales agent of this clamp.

The Ralston Steel Car Company, Columbus, Ohio, has been rebuilding its plant and making large additions. This work has almost been completed. The main shop has been remodelled, enlarged and equipped with new machinery. The building is now of all steel construction with asbestos corrugated roof, improved ventilators, skylights and other facilities. Additional traveling cranes, electric hoists, etc., have been installed in various departments, and the capacity of the shops has been increased so that 40 freight cars a day can now be turned out. This company, in addition to freight cars of all classes, makes steel underframes for cars and also furnishes miscellaneous parts for all kinds of repairs.

LOCOMOTIVE SUPERHEATER PROGRESS.

During the interval between the conventions of 1910 and 1911 the number of locomotives using highly superheated steam increased from about 6000 in all countries to approximately 9000. About 1000 of this increase was on American railways, which practically doubled the number in service in this country. The past year has shown an increase in the total number of superheaters in service in all countries of over 4000, making the total number in service at the present time between 13,000 and 14,000. Of this number over 2000 were applied to American locomotives, thus repeating the history of the previous year by adding 100 per cent to the number of locomotives equipped with superheaters in this country.

A notable feature in this increase in the number of superheaters applied to locomotives in the past year has been that the fire tube type has been adopted practically unanimously and of the fire tube type the top header design has been used to the almost total exclusion of all other designs. The probable reason for this practice is that the top header fire tube type superheater adapts itself most perfectly to the conditions and to best meet the requirements of simplicity in construction and design, accessibility for the maintenance parts of the locomotive adjacent to it, efficiency in operation, continuity of service and low maintenance costs. This design of superheater consists of an integral header located in the upper part of the smokebox, where it in no way obstructs the front end or interferes with the maintenance of the boiler flues. It is designed to reduce the wire-drawing effect of the steam to the minimum and the arrangement of superheater pipes in the large boiler flues is such that they are easily accessible and removable, and so constructed that the unequal expansion caused by the difference in temperature as the steam passes through them will be taken care of. A set

of superheater flues is located in the upper part of the boiler where the temperature is highest and the tendency toward clogging is least. This design of superheater furnishes steam continuously at a temperature from 600 to 650 deg. F., while the engine is working.

The remarkable progress that has been made in the application of highly superheated steam to locomotives in this country is shown by the following list of the users of the fire tube type of superheater.

Statement of superheaters ordered from the Locomotive Superheater Company up to June 1, 1912. "In service" includes all superheater equipment delivered to railways. "Under construction" includes all superheaters on order and not delivered:

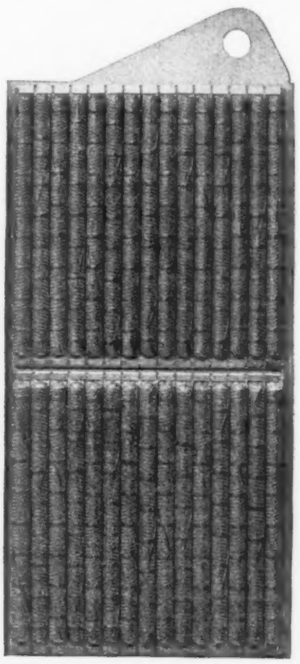
Railway.	Superheater Locomotives In Service.	Under Construction.	Total.
Algoma Central & Hudson Bay	10	5	15
Algoma & Eastern	..	2	2
Ann Arbor	2	3	5
Atchison, Topeka & Santa Fe	5	50	55
Atlanta, Birmingham & Atlantic	..	10	10
Atlantic Coast Line	..	20	20
Baldwin Locomotive Works	..	50	50
Baltimore & Ohio	72	5	77
Bingham & Garfield	3	1	4
Boston & Albany	11	..	11
Boston & Maine	1	..	1
Buenos Ayres	2	..	2
Buffalo, Rochester & Pittsburgh	12	1	13
Canadian Northern	116	..	116
Canadian Pacific	947	133	1,080
Central of Brazil	10	..	10
Central of Georgia	6	..	6
Central of New England	..	15	15
Central of New Jersey	1	..	1
Central Pacific	..	8	8
Charleston & Western Carolina	..	2	2
Cheseapeake & Ohio	30	49	79
Chicago & Alton	30	..	30
Chicago & Eastern Illinois	10	..	10
Chicago & North Western	165	5	170
Chicago, Burlington & Quincy	4	..	4
Chicago Great Western	4	10	14
Chicago, Indianapolis & Louisville	11	19	30
Chicago, Indiana & Southern	8	6	14
Chicago, Milwaukee & St. Paul	37	140	177
Chicago, Rock Island & Pacific	50	50	100
Chicago, St. Paul, Minneapolis & Omaha	18	..	18
Chicago, Terre Haute & Southeastern	..	5	5
Cincinnati, New Orleans & Texas Pacific	5	..	5
Cleveland, Cincinnati, Chicago & St. Louis	104	36	140
Cuba Railroad	13	..	13
Cumberland Valley	1	1	2
Delaware & Hudson	9	12	21
Delaware, Lackawanna & Western	6	25	31
Duluth, South Shore & Atlantic	2	..	2
Duluth, Winnipeg & Pacific	10	..	10
Elgin, Joliet & Eastern	..	1	1
El Paso & Southwestern	20	..	20
Erie Railroad	46	..	46
Florida East Coast	5	..	5
Grand Trunk	9	..	9
Grand Trunk Pacific	40	..	40
Great Northern	22	..	22
Hocking Valley	..	7	7
Illinois Central	126	..	126
Imperial Government Railway of Japan	36	..	36
Imperial Pekin-Kalgan	..	2	2
Imperial Taiwan Railway of Formosa	..	3	3
Intercolonial Railway	5	..	5
Kanawha & Michigan	10	..	10
Kansas City Southern	20	..	20
Lake Erie & Western	8	7	15
Lake Shore & Michigan Southern	173	61	234
Lehigh Valley	1	22	23
Louisville & Nashville	13	25	38
Maine Central	9	..	9
Manila Railway	..	10	10
Michigan Central	37	30	67
Minneapolis, St. Paul & Sault Ste Marie	37	5	42
Missouri, Kansas & Texas	7	..	7
Missouri, Oklahoma & Gulf	..	5	5
Missouri Pacific	65	15	80
Mobile & Ohio	6	4	10
New Orleans, Mobile & Chicago	..	12	12
New York Central	360	85	445
New York, Chicago & St. Louis	4	..	4
New York, New Haven & Hartford	21	..	21
New York, Philadelphia & Norfolk	1	..	1
New Zealand Government	14	..	14
Norfolk & Western	27	31	58
Northern Pacific	99	..	99
Oregon Short Line	..	30	30
Oregon, Washington R. R. & Navigation Co.	..	15	15
Paulista Railway	3	..	3
Pennsylvania	80	37	117
Pennsylvania Lines West	28	..	28
Peoria & Eastern	..	10	10
Pere Marquette	30	..	30
Philadelphia & Reading	1	..	1
Philadelphia, Baltimore & Washington	..	1	1
Pittsburgh & Lake Erie	5	6	11
Purdue University	1	..	1
Rutland Railroad	6	5	11
St. Louis & Hannibal	..	1	1
St. Louis & San Francisco	33	..	33
St. Louis & Southwestern	..	18	18
Seaboard Air Line	2	..	2
Southern Railway	60	5	65
Southern Pacific	..	57	57
South African Government Railway	16	..	16
Temiskaming & Northern Ontario	..	4	4
Terminal Railways of St. Louis	..	15	15
Toledo & Ohio Central	1	11	12
Toronto, Hamilton & Buffalo	3	4	7
Union Pacific	..	40	40
Vandalia	4	..	4
Virginian	9	5	14
Virginia & Southwestern	7	..	7
Wabash, Pittsburgh Terminal	1	..	1
Western Maryland	1	24	25
Western Railway of Havana	2	..	2
Total	3,226	1.279	4,505

EDISON STORAGE BATTERY FOR TRAIN LIGHTING.

The statement has been made by the Edison Storage Battery Company, Orange, N. J., that at least ten years of service should be obtained from the storage batteries in car lighting service, with little or no depreciation in capacity. These batteries are compact, requiring a comparatively small amount of space; are free from chemicals and electrical troubles and are practically indestructible.

The old type storage battery, with which all car-lighting men are familiar, consists of lead plates immersed in sulphuric acid. The Edison Storage Battery plates consist of nickelled steel frames with the active material enclosed in perforated nickelled steel tubes and pockets, instead of being formed on the surface of the plates. The active materials are nickel hydrate and metallic iron. The electrolyte is a solution of 21 per cent. potassium hydrate with a small amount of lithium hydrate. The elements are placed in a nickelled steel container.

Positive Electrode Tube.



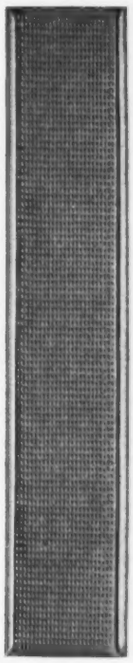
One of the Positive Electrodes.

The positive or nickel plate consists of thirty perforated steel tubes in two rows, heavily nickel-plated, filled with alternate layers of nickel hydroxide and exceedingly thin flakes of pure metallic nickel. The tube is formed from a perforated ribbon of nickel-plated steel, and has a lapped spiral seam. This tube, after being filled with active material, is reinforced with eight seamless steel rings which prevent the tube expanding away from and breaking contact with its contents. The tubes after being flanged at both ends are clamped into perfect contact with a steel frame or grid, made of cold-rolled steel, heavily nickel-plated.

The negative or iron plate consists of a grid of cold-

rolled steel, nickel-plated, holding a number of rectangular pockets filled with powdered iron oxide. These pockets are stamped from a ribbon of very finely perforated nickelled steel. After the pockets are filled, they are inserted in a grid and subjected to great pressure between dies which corrugate their surfaces, and force them into integral contact with the grid.

One of the Negative Electrodes.

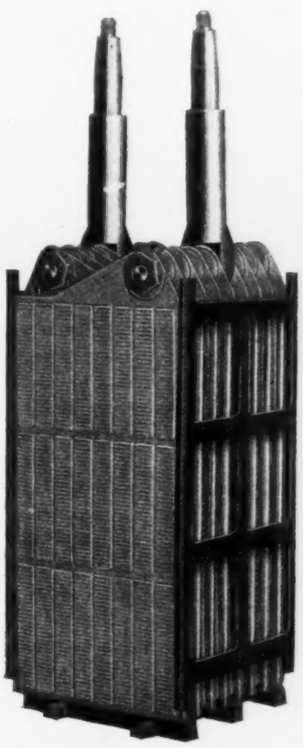


Pocket for Negative Electrode.

The method of insulating the plates from each other, and from the steel container is illustrated. After the plates have been assembled into a complete element, narrow strips of specially treated hard rubber are inserted between them, thereby separating them and insulating them from each other. These correspond to the wood and rubber separators used in lead batteries, but unlike them are not injured by the electrolyte and need never be renewed. The end insulator is provided with grooves that take the edges of the plates and insulate the complete element from the steel container. At the sides of the element, that is, between the outside negative plates and the container, are inserted smooth sheets of hard rubber. At the bottom the element rests upon a hard ruber rack or bridge, insulating the plates from the bottom of the container. This bridge is shallow, providing very little sediment space, such provision being unnecessary in the Edison cell because active material is not precipitated from the plates.

The container or jar is made from cold-rolled sheet-steel of fine quality, welded at the seams by the autogenous method, making leakage or breakage from severe vibration impossible. The walls of the container are corrugated so as to give maximum strength with minimum weight. The steel is heavily nickelled as a protection against rust. As an additional protection, the cell is dipped in a compound which gives it a tough, yet flexible, insulating coating. The bottom of the container is also of cold-rolled steel. Containers for car lighting cells are made three inches higher than those for vehicle service, giving greater capacity for electrolyte.

The cover is of the same quality nickelled sheet-steel. Mounted on the top, and situated between the two terminals, is the gas vent and filling aperture combined. This consists of a seat, a hemispherical valve, and a top actuated by a spring to remain fully open for filling, or closed for operating, as desired. The valve is so arranged that as the gas pressure in the cell rises sufficiently to raise it, the escaping gas flows by and out under the spring-actuated



Edison Storage Battery as Assembled Before Placing in Container.

Contents of Edison Storage Battery Container Partly Lifted.

Edison Storage Battery Cell.

top. It is evident that gases from within the cell can get out, but impurities, air, etc., from without cannot get into the cell.

The method of assembling plates on steel connector rods with steel spacing washers, all being attached to the terminal post, is shown in one of the illustrations. The posts are turned up from steel bar stock, the top of the terminal being tapered and ground to an exact fit with the terminal lug. The tip of the post is threaded to take a nut which holds down the lug. The terminal posts are effectually insulated from the cover by means of hard rubber washers and bushings. A soft rubber washer, used for packing to prevent the solution from creeping, also serves as an insulator. This packing washer is held down by a heavy hard rubber gasket threaded into a pocket on the cell cover. The rubber gasket at the positive pole is red in color while that at the negative pole is black. The positive pole is further distinguished by a plus mark stamped into the steel cover.

The terminal lug is a drop forging of steel, bored and reamed and ground to a taper, to fit the tapered top of the terminal post. The connecting link between the two lugs is of copper. The copper link is swedged into the lug forgings, making a perfect and permanent contact. These links are made in various lengths to suit the spacing of the different size cells. After the swedging, the link with its lugs is given a heavy coating of nickel. Car-lighting men will appreciate the Edison method of connecting and disconnecting cells. No cutting of lead straps is necessary, nor is there any lead burning to be done. Remove the side slats, unscrew two nuts and lift the cell out of the set.

The electrolyte does not vary in density as does the acid electrolyte in a lead battery, nor is the capacity of the Edison battery affected by slight variations. Frequent specific gravity readings are, therefore, unnecessary. For convenience a special cell filler has been designed which rings a bell when the electrolyte has reached the proper height in the container.

There is no acid used in the Edison cell, and consequently no acid fumes are given off, nor is there any corrosion.

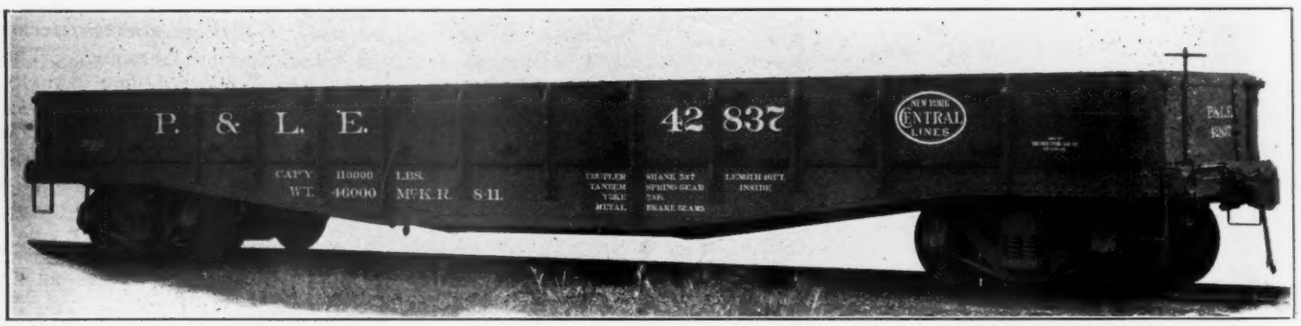
The cells are assembled in wooden trays with pressed steel cradles suspended from the sides. The flange on the bottom of each cell fits into a groove in the cradle, and a pressed steel "hold-down" at the top keeps it rigidly in position. The tray is designed with an air space beneath the steel cradles, making the grounding of cells impossible, unless a great amount of dirt is allowed to accumulate. The weight of a single tray with 3 cells for car lighting, 300 ampere hours capacity, is only about 100 lbs.

The average discharge voltage of the Edison cell is 1.24 volts at the eight hour rate of discharge. The standard number of cells is therefore, 25 for 30-volt equipments, and 50 for 60-volt equipments.

COMPOSITE GONDOLA CAR.

The New York Central Lines have recently received 1,000 composite gondola cars from the Pressed Steel Car Company, Pittsburgh, Pa., which are designed to handle pipe and structural steel. They are 46 ft. long and are constructed to carry a 110,000 lb., uniformly distributed load, with a possibility of a 10 per cent. overload. With these cars it is possible to load two tiers of 22 ft. pipe, whereas with old 40 ft. and 42 ft. cars but one tier could be loaded. The cars are equipped with drop ends, in case it should be desired to load material of more than 46 ft. in length, and are made strong enough to carry ⅔ of the rated capacity concentrated over a space 10 ft. long at the center of the car.

The underframes are of the built-up type with two center sills 30 in. deep at the center and 12 in. deep over the bolsters, and two side sills 26 in. deep at the center and 10 in. deep over the bolsters. The center sills are made of ⅜ in. thick steel plates and each sill is reinforced at the bottom with two 4 in. x 3½ in. x ½ in. angles, and at the top by one 3½ in. x 3 in. x ⅜ in. angle, the two sills being tied together by a cover plate 7/16 in. thick by 21¼ in. wide. The center sills run continuously through the body bolsters, and the draft sills, which are made of ⅜ in. pressed steel are spliced to them immediately in front of the bolster. The side sills are made of 5/16 in. steel plates and are reinforced at the top and bottom by a 4 in. x 3½ in. x ½ in. angle. They extend from end to end of the car and are connected to the end sills by means of pressed steel sub-side sills. The end sills are made of 10-in. channels with a 7/16 in. pressed steel angle cover plate riveted to the top flange.



46-Ft. Composite Gondola Car.

The body bolster is made of pressed steel diaphragms placed back to back with a top cover plate of ½ in. steel, 16 in. wide and a bottom cover plate of ½ in., steel 14 in. wide securely riveted to the flanges. The ends of the body bolster are fastened to the side sills with two 6 in. x 3½ in. x ⅜ in. angles. There are two cross bearers near the center of the car, made up of ¼ in. pressed steel plates, flanged on all sides, with a ⅜ in. top cover plate 10 in. wide passing through the web of the center sills immediately under the top reinforcing angles, and a bottom cover plate of the same size passing under the center sills and riveted to the flanges of the diaphragms and center sill bottom angles. In addition to the cross bearers there are 8 sets of floor supports made of ¼ in. pressed steel extending between the center and side sills.

The floor is made of 2½ in. yellow pine, tongued and grooved, and the sides of 3 in. yellow pine capped with a 3 in. x 3 in. x ¼ in. protection angle, and held by twelve 5/16 in. pressed steel stakes on each side and a double corner post of ⅝ in. steel at each corner, which also forms a stop for the end gate. Each side of the car is also fitted with 9 pairs of outside stake pockets. The ends of the car are constructed of 3½ in. x 10 in. yellow pine boards bound together in the shape of gates which fold backward flat upon the floor of the car.

The sill steps, hand holds and all safety appliances are strictly in accordance with the Interstate Commerce Commission requirements. The cars are equipped with the Westinghouse HC-10-12 air brakes, tandem spring draft gear, cast steel 5 in. x 7 in. shank couplers, ball bearing center plates and side bearings and 5½ in. x 10 in. trucks with cast steel side frames.

The general dimensions are as follows:

Length inside of car	46 ft.
Width inside of car	8 ft. 9 in.
Height inside of car	2 ft. 6¼ in.
Length over end sills	47 ft. 9 in.
Width over all	10 ft. 0 in.
Height from top of rail to top of floor	3 ft. 10⅞ in.
Height from top of rail to top of sides	6 ft. 5⅛ in.
Distance from center to center of trucks	37 ft. 3 in.
Cubic capacity { level full	1,015 cu. ft.
Cubic capacity { 10 in. average heap	1,350 cu. ft.
Weight of car body	30,200 lbs.
Weight of trucks	15,800 lbs.
Total dead weight	46,000 lbs.
Maximum load uniformly distributed	121,000 lbs.

DUPLEX BRAKE BEAM STRUT.

The new brake beam strut, here illustrated, is a one-piece casting designed to permit the use of the brake beam for either right or left hand in emergencies and avoid the objections that have been raised to the reversible strut which is made up of several parts.

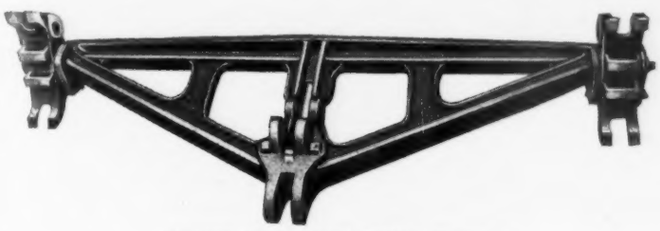
The many advantages of being able to use a beam as either right or left hand are obvious. Another good feature of this strut is that it is provided with two lever pin holes. As these

Duplex Brake Beam Strut.

holes wear in the line of pull, the life of the brake beam may be increased by reversing the strut, and so allowing the use of the second and unworn pin hole. This strut surrounds the brake beam tension member and in this way makes it safer. The beams equipped with these struts, as made by the Chicago Railway Equipment Company, are provided to take the Creco sliding third point support and the struts are designed to clamp about the beam compression member in several different ways to suit the requirements of service.

VULCAN CAST STEEL BRAKE BEAM.

A prominent feature of the exhibit of the American Steel Foundries, Chicago, is the Vulcan cast steel brake beam and the Sampson bolster. The Vulcan beam is made of a one-piece steel casting and is intended for use with a high speed brake



Vulcan Cast Steel Brake Beam.

in connection with P. C. or L. N. air brake apparatus. The deflection of this beam under heavy loads is very small, and, owing to the construction, the deflection at the end of years of service will be no greater than when new, as there are no loose parts about the beam to wear out or break.

FORSYTH RADIAL YOKE CONNECTION.

The Forsyth "Radial" Yoke Connection is designed, not merely for a simple and durable connection between the draft gear and the drawbar, and one that can be used with any standard draft gear and drawbar, but to eliminate destructive side strains by allowing both the drawbar and yoke plenty of side clearance on curves. Heretofore the chief objection to a

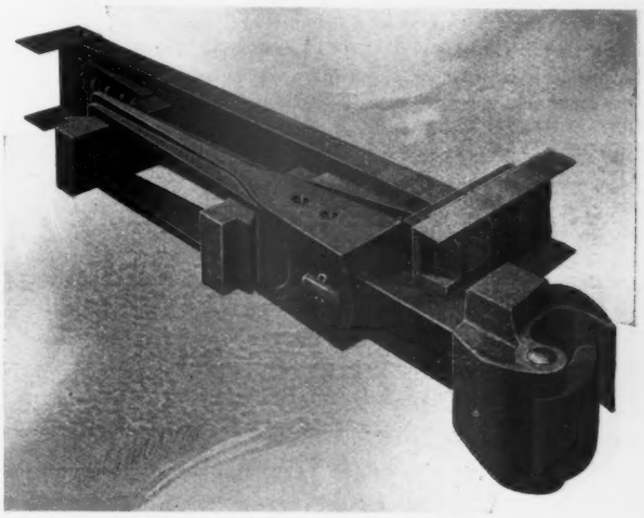


Fig. 1—Forsyth Radial Yoke.

yoke, or strap connection, has been the shearing of yoke rivets. It is manifestly unjust to condemn a yoke because of the occasional failure of the *means of connection* between it and the drawbar, when such failures can be practically eliminated. It has been customary to maintain the old wrought iron yoke, with uniform width throughout its length, substantially on the center line of the gear by bringing up the follower stops, or

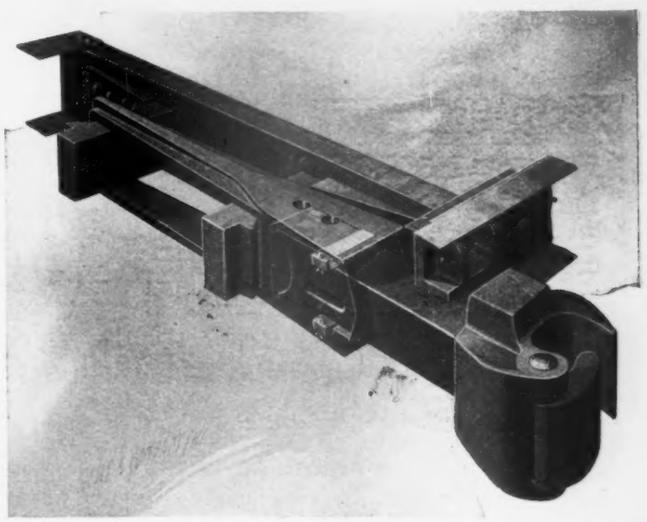


Fig. 2—Forsyth Radial Yoke, Arranged with Key Attachment to Coupler.

draft lugs, within a short distance, say ½ inch, of the lateral edges of the yoke. Under these conditions, it is evident that when the drawbar allows a slightly increased side travel, the yoke first strikes against one of the follower stops, and then becomes actually bound between the diagonally opposite follower stops. The drawbar and yoke are now to each other like the blades of a shear, and further movement of the drawbar to one side can only have the effect of transmitting enormous

shearing strains to the yoke rivets. These stresses, rather than those of draft, have caused the failure of the yoke rivets in the past. Proof of this can be found by examining cars in service, on which it will frequently be noted that—even where the inwardly turned lips at the front end of the yoke are at right angles to the drawbar and in good condition, and also engage the shoulders of the drawbar butt—the rivets are nevertheless found to be loose or sheared.

Under buffing stresses or on curves it must be evident that greater clearance is needed between the inner end of the yoke and the rear follower stops, or draft lugs, than is required between the drawbar butt and the front follower stops. In order to meet this condition, the Forsyth yoke is tapered horizontally

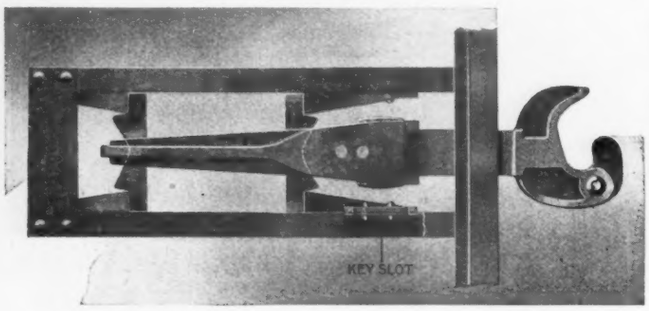


Fig. 3—Forsyth Radial Yoke in Central Position.

toward its inner end, with a corresponding increase in the vertical thickness to preserve a uniform cross sectional area and maintain a uniform strength throughout.

In the Forsyth yoke, Fig. 1, there is provided immediately back of the drawbar butt a vertical member cast in one piece with the yoke, which member has a convex face adapted to bear against the outer face of the front follower. The rear vertical wall of the yoke is also provided with a corresponding convex face, designed to bear against the outer face of the rear follower. It will be noted that the outer faces of the followers are provided with inclined bearing surfaces, which engage the convex bearing surfaces of the yoke. When the drawbar and yoke are drawn to one side on a curve, and then released, the

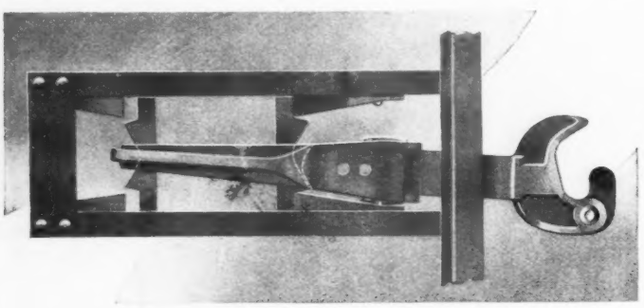


Fig. 4—Forsyth Radial Yoke on Curve.

spring of the draft gear will thrust the followers outward, causing the convex faces of the yoke to slide down the concave faces of the followers, and thereby return the drawbar and yoke to an automatic coupling position. There is sufficient play allowed to effect coupling on curves, but the radial device will always return the drawbar on straight track sufficiently close to the center of the track to permit automatic coupling.

The rounded bearing surfaces also prevent the canting of the followers on curves, and the consequent side distortion of the draft gear. Heretofore, where the rocking has taken place between flat surfaces (as between the flat ends of the drawbar and the flat face of the front follower), canting of the followers has taken place and the draft gear has been unevenly worn and injured. Another point of merit in the Forsyth radial yoke, in connection with the front bearing at the inner end of the drawbar, is that this bearing acts as a stop member to prevent end displacement of the gear and followers when the drawbar is removed. Heretofore, when replacing an old drawbar, it has been necessary to re-assemble the gear within the yoke under tension.

The Forsyth radial yoke connection may be attached to the drawbar butt by means of the ordinary yoke rivets or by keys. The latter, as shown in Figs. 1 and 2, may be a central one, adapted for insertion through a corresponding slot in the drawbar; or, if the drawbar is not provided with a center slot, top and bottom keys can be used, as shown in Fig. 2. These afford a greater area of contact to withstand the shocks than the center key, as they bear clear across the shoulders of the drawbar butt, as well as against corresponding shoulders on the top and bottom walls of the yoke. The yokes can be furnished to take a 9⅛-inch, or any other height of drawbar butt.

In general freight car construction working within ⅛ in. to ¼ in. is usually acceptable, and, therefore, it must be evident that when the gear goes solid against a front or rear abutment, it is practically impossible for the ends of the keys to strike the ends of the slots at the same time. On curves it is impossible, as, in the latter case, the keys are no longer at right angles to the sills, and, therefore, could only strike the ends of the slots on one side, affording the gear a weak stop bearing, in addition to cutting down the travel.

The chamber at the forward end of the Forsyth yoke is made sufficiently large to allow for variations in the drawbar butt, without permitting undue or objectionable lost motion at this point.

The cost of the radial yoke and followers is moderate, especially when it is considered that they take the place of the ordinary wrought iron yoke and flat followers and that they include a centering device for both the yoke and drawbar. The drawbar of a freight car should be allowed a side clearance of at least 2 in. on each side at the carry iron. After a clearance of 1 in., automatic coupling is made more certain by the use of a centering device, otherwise the guard arms and knuckles will frequently pass by each other. A drawbar centering device for freight equipment (wherein the yoke or other means of attachment should swing with the drawbar on curves) must center both the drawbar and the yoke. In the case of passenger cars, however, where the drawbar is pivoted to the yoke, a centering device located at the carry iron, for centering the drawbar only, is sufficient.

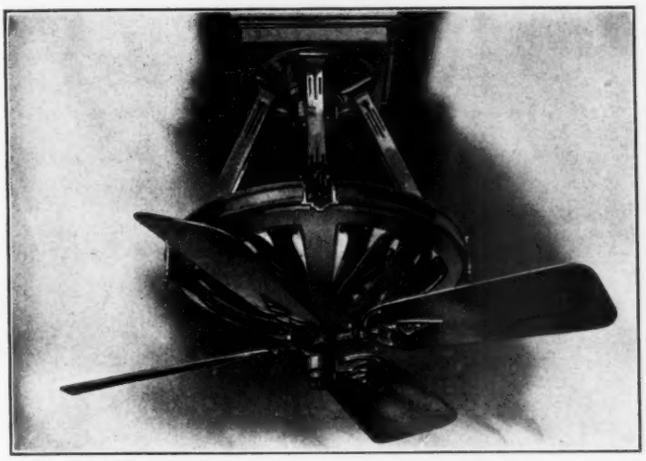
Figs. 3 and 4 show the drawbar and radial yoke on straight and curved tracks respectively. The radial yoke has been proved out by years of service. It is manufactured by Forsyth Brothers Company, of Chicago.

ELECTRIC FIXTURE COMBINING INDIRECT LIGHTING AND PADDLE FANS.

The Frisco Lines have recently installed a rather unique arrangement of fans and lighting fixtures on several new club-cafe cars. In considering the use of electric indirect lighting and electric paddle fans, it was found undesirable to install separate fixtures for each of these systems, owing to the resulting crowded appearance of the car ceiling. Several suggestions were considered to overcome this difficulty, and The Safety Car Heating & Lighting Company, New York, was asked to submit a suitable fixture. As a result, the fixture illustrated herewith was finally accepted and installed, in which both the indirect lighting and the paddle fans are combined. This arrangement is a novel one, and from the illustration it will be seen that the effect is not displeasing.

A motor is installed in each of the fixtures, and is located above the ceiling base of the fixture between the ceiling and the roof of the car. A flexible shaft connects the motor with the paddle fans and compensates for any unevenness in the headlining of the car or the vibration of the fixture.

Contained in the art glass bowl, are four mirror reflectors, designed to direct the maximum rays of the electric lamps at the proper angle to the ceiling. It is obvious that to obtain the best efficiency the ceilings must have a light color. If the paddle fans are not required, they can be removed and stored away, until they are again needed.



Electric Fixture Combining Indirect Lighting and Paddle Fan.

Indirect lighting has been successfully developed by The Safety Car Heating & Lighting Company, and this fixture is another development along this line. A duplicate of the fixture without the paddle fans is exhibited by this company at its booth, and although no provision has been made to demonstrate the effectiveness of the lighting from it, an opportunity is afforded for those interested to gain an idea of the appearance of such a lamp.

LIST OF EXHIBITORS.

Notwithstanding the fact that 7,400 sq. ft. additional exhibit space was available this year as compared with last year, between 75 and 100 applicants for space could not be accommodated, and applications are still coming in. There are 262 exhibitors this year, using a total of 83,507 sq. ft. of space, as against 245 exhibitors, with 76,110 sq. ft. of space, in 1911, and 228 exhibitors, with 71,453 sq. ft. of space, in 1910. The average numbers of square feet to the exhibitor during this period were 313, 310 and 319, respectively. It is reasonably certain that if one-third more space were available for exhibits it would all be used.

The increased space this year was obtained by an extension of 4,860 sq. ft. on Machinery Hall, and by adding a new steel and wood arched structure to the Hotel Men's Annex, giving it a total of 11,283 sq. ft., an increase of 2,537 sq. ft. Some improvements have also been made in the Convention Hall. The decorations are more profuse, but otherwise similar to preceding years.

The Railway Supply Manufacturers' Association this year has installed, with the aid of the local electric light company, the generating set supplying power for the pier. New boilers were installed, and it is expected that ample power can be furnished for every need.

Acme Supply Company, Chicago Ill.—Vestibule diaphragms; vestibule curtains; diaphragm attachments; weatherproof windows; interior car curtains; steel doors; steel ladders; Chanarch car flooring; weatherproof window posts. Represented by H. H. Schroyer, T. K. Dunbar and C. R. Jamison. Space 572, 573.

Ajax Manufacturing Company, The, Cleveland, Ohio.—Ajax scrap reclaiming rolls and forgings produced on Ajax forging machines. Represented by John R. Blakeslee, A. L. Guilford and J. A. Murray. Space 113, 115, 117.

Alcohol Heating & Lighting Company, Chicago Ill.—Alcohol heater refrigerator car; models alcohol heater car; several types of alcohol portable stove. Represented by Herbert Green

terials used in manufacture of feralun; feralun heat resistant castings. Test plates showing comparison of feralun and iron. Fire door liner; grate bar; feralun abrasion resistant castings; section of ash or sand conveying pipe; sections of wearing plates; mounted section spiral conveyor. Photographs. Feralun anti-slip thread surfaces' devices. Represented by J. P. Warfle. Space 634.

American Arch Company, New York, N. Y.—Model of a locomotive boiler equipped with the American Security Arch; various types of locomotive fire brick. Represented by Le Grand Parish, J. P. Neff, Geo. Magstaff and John Nicholson, Space 412, 414.

American Balance Valve Company, The, Jersey Shore, Pa.—Wilson-Stevens valve gear with Jack Wilson high pressure internal admition slide valve. Walcheart valve gear with semi-plug piston valve. Full size semi-plug piston valves for superheat and saturated steam. Models of semi-plug piston valves; Jack Wilson valves for superheat and saturated steam and American balance slide valves. Represented by J. T. Wilson, Frank Trunp and C. C. Young. Space 383.

American Brake Company, The, St. Louis, Mo.—Westinghouse booth. Represented by E. L. Adreon and R. E. Adreon. Space 19, 21, 23, 25, 27, 29.

American Brake Shoe & Foundry Company, Mahwah, New Jersey.—Brake shoes for locomotives; passenger and freight equipment and electric railway equipment. Brake heads and keys. Represented by F. W. Sargent, W. S. McGowan, W. G. Pearce, J. B. Terbell, F. L. Gordon, J. S. Thompson, E. L. Janes, E. B. Smith, George Law, J. V. Hogan, R. M. Brower, J. R. Haywood and R. E. Holt. Space 416.

American Brass Company, The, Coe Brass Company Branch, Ansonia, Conn.—Extruded and pressed brass shapes for car trimmings. Represented by Chas. E. Van Riper, Wm. H. Rippere, R. S. Wildman and Wm. W. Cotter. Space 518.

American Car and Foundry Company, New York, N. Y.—Reception booth. Represented by B. M. Carr, C. A. Liddle, Scott H. Blewett, S. M. Dolan, L. W. Martin, Wm. C. Dickerman, John McE. Ames, A. E. Ostrander, C. D. Eaton and E. H. Fisher. Space 619.

American Infusion Steel Process Company, New York, N. Y.—A process for converting a low grade steel into a high grade steel. Represented by W. C. Whyte, A. J. Thompson, R. C. Longenecker and V. J. Thompson. Space 172.

American Locomotive Company, New York, N. Y.—Reception booth. Represented by H. F. Ball, G. M. Basford, J. D. Sawyer, C. J. Donahue, W. L. Reid, W. P. Steele, H. B. Hunt, J. E. Dixon and C. M. Muchnic.

American Mason Safety Tread Company, Boston, Mass.—Mason safety treads, lead filled; Empire safety treads, carborundum filled; Stanwood treads, for car steps; Karbolith composition flooring. Represented by Henry C. King, L. H. Myrick and R. C. Davison. Space 609.

American Nut & Bolt Fastener Company, Pittsburgh, Pa.—Bartley nut and bolt fasteners, Bartley self-locking nut and bolt fasteners. Represented by Edwin M. White, Christopher Murphy, Robert Spencer and Jos. R. Royston. Space 310.

American Pulley Company, Philadelphia, Pa.—Axle pulley for electric lighting on steam railroad cars. Represented by Morris W. Rudderow. Space 401.

American Roll Gold Leaf Company, Providence, R. I.—Roll gold leaf; roll aluminum leaf and gold florentine metal leaf. Represented by T. J. Lawler, C. H. Bowers and C. E. Smith. Space 631.

American Steel Foundries, Chicago, Ill.—Cast steel products: Vulcan cast steel side frames; Vulcan cast steel brake beams; Samson bolster; Simplex couplers; Hercules and Ajax brake beams; Susemihl roller side bearings; Davis wheels; springs and miscellaneous castings. Represented by R. P. Lamont, Geo. E. Scott, R. H. Ripley, W. J. Lynch, J. C. Davis, T. D. Kelley, J. V. Bell, G. F. Slaughter, W. Ross Gravener, Geo. C. Murray, Theodore Cook, P. J. Kalman, D. T. Harris, J. W. Dalman, A. R. Brunker, W. A. Blanchard, A. S. Crozier, T. H. Hopkirk, W. M. Rogovine, R. E. Janney, Geo. G. Floyd, F. B. Ernst and Louis E. Jones. Spaces 185, 186.

American Tool Work Company, Cincinnati, Ohio.—One 24" x 12' geared head lathe driven by 15 H. P. General Electric motor; one 16" x 8' relieving lathe driven by Crocker-Wheeler motor; one 2' geared radial drill driven by 3 H. P. Westinghouse motor; one 3' sensitive radiator driven by 2½ H. P., G. E. motor; one 6' plain radial driven by 20 H. P. Westinghouse motor; one 16" shaper with a universal table and vise; one 24" shaper driven by 7½ H. P. Reliance motor. Numerous details of machines shown. Represented by Robert S. Alter, C. K. Cairns, Herman Schatz and Edward Conners. Spaces 103, 105, 107, 109, 111.

American Vanadium Company, Pittsburgh, Pa.—Vanadium steel, iron, brass and bronze locomotive parts; vanadium steel forgings and castings, vanadium tool steels, vanadium ores and vanadium alloys. Represented by J. J. Flannery, W. A. Bonitz,

D. B. Browne, C. L. Hastings, W. J. Bird, P. A. Bevan and G. L. Norris. Space 211.

Anchor Packing Company, Philadelphia, Pa.—Packing and mechanical rubber goods. Represented by L. F. Adams, G. A. Morrison, E. C. Adams, W. P. Haggart, J. D. Maguire, H. M. Green, J. F. Edmonds, C. M. Barnes and B. J. Miller. Space 378.

Automatic Ventilator Company, New York, N. Y.—Miniature working models of the "Automatic" car ventilator, models of several types of self-acting intake-and-exhaust car ventilators, including those meeting requirements of the postal department, as per recent specifications for railway postal cars. Represented by George H. Ford, Frank A. Barbey and Wm. J. Fleming, Jr. Space 329.

Baker Brothers, Toledo, Ohio.—One 1 in. by 6 in. Automatic Drilling Machine for rapid manufacturing production. Represented by Geo. E. Hallenbeck, H. M. Chilcote and W. W. Elliott. Space 140.

Baker Car Heater Company, W. C., Detroit, Mich.—One No. 9 steel shell fire proof heater, one No. 1-C hot water heater, one No. 3-P forced ventilation hot air heater, one No. 3-K electric forced ventilation hot air heater. Represented by E. J. Smith, D. W. Smith and H. S. Williams. Space 214.

Baldwin Locomotive Works, Philadelphia, Pa.—Pneumatic power reverse gear for locomotives. Represented by S. M. Vauclain, C. Greenough and A. S. Goble. Space 300.

Barco Brass & Joint Company, Chicago, Ill.—Barco Flexible Joints for steam, air, oil and water; engine-tender steam, air and oil connections; round-house blower sets. One complete engine tender flexible joint equipment, including steam line, train line, signal line and tender brakes so arranged as to show every angle of movement required by the engine and tender. Represented by F. N. Bard and E. S. Nelson. Space 374.

Baush Machine Tool Company, Springfield, Mass.—One hydro-pneumatic radial drill in operation; General Electric Co. automatic air compressor furnishing air. Represented by C. K. Lassiter, F. E. Becorselski, J. A. Eden and Chas. A. Smith. Space 119.

Berry Brothers, Limited, Detroit, Mich.—Varnish panels, varnish gums, shellacs, japans, locomotive block, jacket enamels, front end finishes, railway varnishes. Represented by J. S. Stevenson, D. W. H. Moreland, John S. Wilson, F. W. Grebe and Walter Page. Space 364, 366.

Best, W. N., New York, N. Y.—Oil burners, oil furnaces, oil regulating cocks. Represented by W. N. Best. Space 308.

Best Manufacturing Company, Pittsburgh, Pa.—Best gate valves, iron, steel and brass, globe valves, flanged fittings, flanges, bends and pipe joints, flexible joints, stand pipes, Gulland stand pipe valves. Represented by H. W. Evans, C. W. Bergen, C. E. Hague and George Best. Space 380.

Bethlehem Steel Company, South Bethlehem, Pa.—Tool steels; Bethlehem structural steel shops; standard high speed steel tools developed by Taylor-White; drop forgings; steel, iron and brass castings; staybolt iron; alternating stress testing machines in operation; Bristol critical point furnace in operation; staybolt vibratory machine in operation; metallographic instruments in operation; vail sections; forged steel hydraulic jacks. Represented by W. C. Cutler, Geo. W. Costello, J. M. Price, John Moran and Hugh Lennon. Space 37.

Bettendorf Axle Company, Bettendorf, Iowa.—One single center sill, 50-ton capacity, 40'-0" underframe with trucks as furnished for the Harriman lines box cars. One double center sill 40-ton capacity, 40'-0", box car underframe. One assembled truck which will be used for demonstrating the ease with which the Bettendorf truck can be dismantled and assembled. One variable load brake truck. Represented by J. W. Bettendorf, M. Bettendorf, J. H. Bendixen, G. N. Caleb, F. K. Shults, A. F. Macpherson, E. E. Silk, W. G. Ransom, C. G. Stolpe and J. L. Goddard. Space 200.

Blackall, R. H., Pittsburgh, Pa.—H-R ratchet brake lever for both freight and passenger cars. Improved lindstrom hand brake lever for both freight and passenger cars. Represented by R. H. Blackall. Space 614.

Boss Nut Company, Chicago, Ill.—Boss nut locks. Represented by J. T. Benedict, J. A. MacLean and Ed. Wilhelm. Space 368, 369.

Bowser & Company, Inc., S. F., Ft. Wayne, Ind.—Standard self measuring oil pumps; one tank and oil pump combined; one paint oil outfit; one power pump; one automatic registering measure; one automobile filling station; one oil filteration and circulating. Represented by C. A. Dunkelberg, W. T. Simpson, Edward Barnes and F. T. Hyndman. Space 30.

Brown Automatic Connector Company, Chattanoooga, Tenn.—Brown automatic air, steam and signal connector: for use in railway passenger service; and air and signal connector, for use in freight service. Represented by M. A. Brown and A. L. Kirkpatrick. Space 306.

Brunix Manufacturing Company, Philadelphia, Pa.—Journal box packing; wiping cloths. Represented by W. B. Howard. Space 212.

Buckeye Steel Castings Company, The, Columbus, Ohio.—Complete cast steel 70-ton truck, truck bolsters, side frames, key connected yoke, journal boxes and couplers. Represented by S. P. Bush, J. C. Whitridge, Geo. Groobey, Geo. T. Johnson, A. H. Thomas and C. B. Goodspeed. Space 603, 605.

Buffalo Brake Beam Company, New York, N. Y.—High speed passenger brake beams. Automatically adjustable brake heads, truss and solid brake beams for all classes of cars, locomotives and electric equipment. Represented by S. A. Crone, Edwin Strassburger, Thomas E. Carliss, Roland C. Fraser, O. W. Meissner and C. E. Barrett. Space 606.

Bullard Machine Tool Company, The, Bridgeport, Conn.—One 42" vertical turret lathe, in operation, driven by Westinghouse motor. Represented by S. H. Bullard, J. W. Bray, R. H. Snider, F. B. Smith and W. B. Price. Space 125, 127.

Buyers' Index Company, Chicago, Ill.—Railway supply index-catalogue and purchasing agents' buying list. Represented by N. F. Rehm, H. E. Frame and Alex Smith. Space 628.

Cambria Steel Company, Johnstown, Pa.—Cambria special axles; "Coffin Process" axles; 100% rail joints; Morrison guard rails. Represented by J. Leonard Reflogle, Ralph V. Sage, W. S. Ottinger, L. B. Morris, E. H. Bankard, Jr., M. G. Baker. Space 506, 508.

Camel Company, Chicago, Ill.—Models of improved Security car doors; Camel I-beam carlines. Represented by P. M. Elliott, J. M. Hopkins, W. W. Darrow and J. F. Comee. Space 565.

Carborundum Company, The Niagara Falls, N. Y.—Carborundum and Aloxite wheels, Aloxite cloth, garnet paper and carborundum safety devices. Represented by C. C. Schumaker, W. W. Sanderson, C. C. Lathrop, R. H. Hogg, J. F. Hanlon and R. S. Marvin. Space 149, 151.

Carey & Company, Philip, Cincinnati, Ohio.—Asbestos and magnesia material for railway use. Represented by D. R. Warfield. Space 564.

Carnegie Steel Company, Pittsburgh, Pa.—Solid rolled steel wheels for passenger train, locomotive and freight car service; slick gear blank and cut gear for motors; bent Carnegie toughened freight car axle; vanadium steel locomotive spring, axle and test pieces; steel sheet piling; concrete reinforcement bars; nickel-plated sections structural, rail and bar mill shapes; transparencies illustrating process of steel manufacture. Represented by John C. Neale, W. G. Clyde, R. B. Woodworth, H. W. Maxson, N. B. Trist, T. W. Williams, Frank Spencer, V. S. Yarnall, G. F. Goddard, K. E. Porter, C. B. Friday, John Hornbrook, W. N. Jeffress, C. F. W. Rys, I. W. Jenks, Lee Bowman, L. C. Bihler and Charles Orchard. Space 418, 546, 547.

Carter Iron Company, Pittsburgh, Pa.—Chain iron; chains; staybolts and engine bolts; physical tests of the raw material. Represented by H. H. Carter and Henry Gilg. Space 36.

Chase & Company, L. C., Boston, Mass.—Car seat coverings. Goat brand plain mohair plush, frieze plush, friezette and Chase leather. Represented by W. P. Underhill and H. C. Hopewell. Space 10.

Chicago Car Door Company, Chicago, Ill.—Car doors, safety brackets. Represented by J. L. Mallory and H. M. Perry. Space 539.

Chicago Car Heating Company, Chicago, Ill.—Vapor system car heating devices; steam hose couplers; steam valves. Represented by Egbert H. Gold, Edward A. Schreiber, B. A. Keeler, F. F. Coggin, G. T. Cooke, R. P. Cooley, E. E. Smith, Jos. Vogel and J. E. Buker. Space 218, 220, 222, 224, 226.

Chicago Pneumatc Tool Company, Chicago, Ill.—Pneumatic and electric tools. Represented by C. E. Walker, J. C. Campbell, M. O'Connor, T. G. Smallwood, J. W. McCabe, W. F. Delaney, C. B. Coates, E. Aplin, A. C. Andresen, Thos. Aldcorn, W. O. Duntley, G. A. Rees and J. F. Duntley. Space 618.

Chicago Railway Equipment Company, Chicago, Ill.—Brake beams of the "PC" Creco, "EL" Creco, Diamond Special, Diamond, Drexel, National Hollow, Kewanee, Reliance, Sterlingworth, Ninety-six, Monarch, and special types. Monitor bolsters; Creco roller side bearings; brake slack adjuster; journal box and lid; automatically adjustable brake head; removable leg brake head; Creco sliding third point support and safety device; reversible and duplex brake beam struths. Represented by E. B. Leigh, Arthur Wyman, F. T. De Long, Raymond H. Pilson, G. N. VanSweringen, C. P. Williams, Edwin F. Leigh, Ralph M. Wiggin, Chas. A. Maher and C. H. Williams, Jr. Space 635.

Chicago Steel Car Company, Chicago, Ill.—Model of steel underframe and two styles of friction draft gears. Represented by H. C. Priebe. Space 520.

Chicago Varnish Company, Chicago, Ill.—Finished panels showing "Ce-Ve" process of painting cars. Represented by George

S. Bigelow, F. L. Olds, Fred J. Gundrum, Jr., and R. K. Buckman, Jr. Space 576, 577.

Chisholm & Moore Manufacturing Company, The, Cleveland, Ohio.—Chain hoists, I-beam trolleys. Represented by H. E. Dickerman. Space 158.

Coe Manufacturing Company, W. H., Providence, R. I.—Coe's ribbon gold leaf and Coe's gilding wheels. Represented by Benjamin A. Smith, E. J. Arlein and S. H. Swallow. Space 633.

Collins Metallic Packing Company, Philadelphia, Pa.—Working model of locomotive driver wheel flange lubricators. Represented by J. George Wholey.

Colonial Steel Company, Pittsburgh, Pa.—Illuminated photographs showing the manufacturing of steel; samples of different tools made from Colonial steel; samples of various alloys used in making steel. Represented by Chas. M. Brown and E. P. Fitzgerald. Space 367.

Commercial Acetylene Company, The, New York, N. Y.—Railroad car lighting by acetylene: Locomotive headlighting by acetylene, signal lighting by acetylene, marker, gauge and cab lights by acetylene; buoy lantern with sun valve and flasher, commercial acetylene tanks for oxy-acetylene welding, commercial acetylene tank cut open showing asbestos packing. Represented by Oscar F. Ostby, Harry G. Doran and Roger J. Faure. Space 339.

Commonwealth Steel Company, St. Louis, Mo.—Photographs, drawings and catalogues showing the followings devices: Combined platforms and double body bolsters for passenger train cars, upright end frame in conjunction with combined double body bolster and platform, double body bolster, four and six-wheel trucks for passenger-train cars, needle beams, end sills, truck center bolsters, truck center frames, locomotive pilot beams, Davis driving wheels, engine and tender trucks, tender bumpers, tender frames, Commonwealth transom draft gear, separable body bolsters, flory carry iron and striking plate. Represented by H. M. Pflager, Geo. E. Howard, Boone V. H. Johnson and Blake C. Howard. Space 313, 315.

Consolidated Car-Heating Company, New York, N. Y.—Pressure traps, vapor traps, steam couplers, end valves, admission valves, Thermostat, electric heaters, switches, resistances. Represented by Cornell S. Hawley, C. C. Nuckols, Thomas Farmer, Jr., W. S. Hammond, Jr., Butler Keys and H. L. Hawley. Space 582, 583.

Consolidated Railway Electric Lighting & Equipment Company, New York, N. Y.—Axle light equipment complete, new type "L" regulator with type "D" dynamo demonstrating while running under all conditions of train speed and lamp load. Represented by P. Kennedy, J. L. Watson, L. J. Kennedy, Thomas L. Mount, D. N. Balderston and J. A. Misland. Space 614.

Crane Company, Chicago, Ill.—Crane locomotive safety valves, special railroad fittings, quick opening locomotive blower valves, locomotive blow-off valves, locomotive cab valves, automatic stop and check valves, special valves for creosote wood preserving plants, steel valves and fittings for superheated steam, Crane tilt steam traps, hydraulic valves, special assortment of brass globe and angle valves for railroad service, gate valves. Represented by F. D. Fenn and G. S. Turner. Space 586, 588.

Crosby Steam Gage & Valve Company, Boston, Mass.—Special locomotive steam gauges; improved locomotive pop-valves; the Lanza continuous diagram appliance for indicators; the number 2 fluid pressure scales for testing gauges up to 30,000 pounds; hydraulic press recorder with continuous chart; air pump throttle valve. Represented by M. D. Johnson and Philip Johnson. Space 630.

Crucible Steel Company of America, Pittsburgh, Pa.—Steel products. Represented by F. Baskerfield, J. T. Stafford and W. K. Krepps. Space 636.

Curtain Supply Company, Chicago, Ill.—Ring No. 88 fixtures, "Rex" all metal rollers, curtain materials, friction rollers, vestibule curtain rollers, reinforced vestibule curtain rollers, steel vestibule curtain rollers, steel sash balance, "CSCO" diaphragms, opening pleat diaphragms, No. 6 roller bearing hook, No. 10 automatic release handles, No. 10 automatic vestibule curtain release handles. Represented by W. H. Forsyth, R. F. Hayes, S. W. Midgley, Geo. E. Fox and F. M. Egolf. Space 638.

Damascus Brake Beam Company, The, Cleveland, Ohio.—High speed passenger beams; freight beams of both solid and truss type; adjustable brake heads; forged steel fulcrums; freight car ladders. Represented by Albert Waycott and W. H. Winterrowd. Space 602.

Davis Boring Tool Company, St. Louis, Mo.—Full line of the Davis expansion boring tools. Represented by E. E. Davis, J. W. McKeen, Harry Marsh and Walter E. Moberley. Space 150.

Davis-Bournonville Company, New York, N. Y.—Oxy-acetylene welding and cutting apparatus; complete welding and cutting equipment; acetylene and oxygen generating and compressing plants. Represented by Augustine Davis, W. R. Noxon, H. L. Adams, Wm. W. Barnes, Wm. Joyce, Louis Shepard, W. C. Buckman and Alex. Blaser. Space, pier end, 1, 2.

Davis Solid Truss Brake Beam Company, Wilmington, Del.—Davis solid truss brake beams; solid steel brake shoe backs; Universal air brake combined auxiliary reservoir and cylinder; brake beam deflectometer and special appliance for testing brake beams; interlocking metal ladders for freight cars; rolling center support for brake beams. Represented by Nathan H. Davis and Thomas C. Davis. Space 500, 502, 504.

Dearborn Drug and Chemical Works, Chicago, Ill.—Reception Booth. Represented by Robert F. Carr, George R. Carr, Grant W. Spear, J. D. Purcell and H. G. McConnaughy. Space 6, 8.

Deforest Sheet & Tin Plate Company, Niles, Ohio.—Lohmannized products and Deforest convolute reinforcement. Represented by Edward D. Thompson and Wade A. Taylor. Space 325.

Detroit Lubricator Company, Detroit, Mich.—No. 0 one feed Bullseye Locomotive Lubricators, No. 5 one feed, No. 11 two feed, No. 22 three feed, No. 22 sectional, No. 32 four feed, No. 42 five feed, No. 52 six feed, No. 62 seven feed, No. 72 eight feed. Half pint air brake lubricator; flange lubricator; one, two, three and four feed air cylinder lubricator, complete with emergency and throttle valve and check valve connection. "T," steam chest plugs, angle and straight; locomotive road cup; locomotive guide cup; Pendry throttle valve; boiler valve; mechanical force feed oiler for motors on section cars. Complete line of all models, sizes and finishes of stationary accessories. Represented by F. W. Hodges, H. I. Lord, A. D. Howard and Geo. Cage. Space 637.

Dickinson, Paul, Incorporated, Chicago, Ill.—Dickinson cast iron smoke jacks; cast iron adjustable chimneys; Æolus ventilators in galvanized iron and copper; drawings of standard round house construction. Represented by A. J. Filkins and J. A. Meaden. Space 213.

Dieter Nut Company, New York, N. Y.—Lock nuts. Space 4.

Dixon Crucible Company, Jos., Jersey City, N. J.—Graphite products for railway use, including lubricating graphite, graphite paint, locomotive front end preparations, graphite crucibles and general railway supplies. Represented by L. H. Snyder, H. A. Nealley, H. W. Chase, John Tucker and William Houston. Space 24.

Dressel Railway Lamp Works, New York, N. Y.—High candle power headlights; combination oil and electric engine lamps; tail lamps; platform marker lamps; automatic caboose lamps; electric, acetylene and oil gage lamps; cab card holders. Represented by F. W. Dressel, Robert Black, H. S. Hoskinson, E. W. Hodgkins, P. P. Claiborne, F. Dressel and F. W. Edmunds. Spaces 384, 385.

Duff Manufacturing Company, The, Pittsburgh, Pa.—Barrett track jacks and automatic lowering jacks; Duff ball bearing screw jacks and the Duff-Bethlehem forged steel hydraulic jacks. Represented by Edw. A. Johnson and Carl A. Methfessel. Space 584, 585.

Duntley Pneumatic Tool Company, Chicago, Ill.—Chippers; riveters and air drills. Represented by J. W. Duntley, Harry Keller and P. H. Gilleland. Space 152.

Dupont de Nemours Powder Company, E. I., Wilmington, Del.—"Fabricoid," an artificial leather for coach curtains and seats. Represented by C. Hallock Silkman and H. W. Wivel. Space 331.

Durbin Automatic Train Pipe Connector Company, St. Louis, Mo.—Automatic air and steam hose coupling and train telephone system. Automatic safety car coupler. Represented by V. S. Durbin, J. F. Blackburn, A. H. Burchard and J. F. Durbin. Space 309, 311.

Eagle Glass & Manufacturing Company, Wellsburg, W. Va.—Locomotive oil cans; bench oilers; shop torches; locomotive torches; locomotive tallow pots; tank buckets; supply cans; grease and dope buckets; cement buckets; wrecking torches, etc. Represented by J. L. Fusner and S. O. Paull. Space 600.

E. D. E. Company, Chicago, Ill.—Insulation for refrigerator cars, passenger cars and ice houses; ventilator for refrigerator car; grain door; track insulation for steam and electric roads; car stopper; thermometer well for refrigerator car. Represented by Frank M. Gilmore. Space 11.

Edison Storage Battery Company, Orange, N. J.—Five exhibition boards showing the assembly and parts of the various sized cells made by this company; car lighting battery equipment; short circuit test on a fully charged Edison battery. Represented by W. G. Bee, R. Bachman, H. G. Thompson, T. V. McGinnis and O. R. Hildebrand. Spaces 625, 627.

Edwards Company, The O. M., Syracuse, N. Y.—Window fixtures; extension platform trap doors; all metal shade rollers; all metal sash balances; padlocks. Represented by O. M.

Edwards, C. H. Rockwell, E. F. Chaffe, W. C. Bradbury, T. P. O'Brian and Roy T. Axe. Space 521, 523.

Electric Controller and Manufacturing Company, Cleveland, Ohio.—Lifting magnet in operation; automatic motor-starters in operation; float switches and pressure gauges; automatic machine tool controllers in operation; type Q electric brakes; crane controllers; circuit breakers; magnetic switches; protective panels. Represented by R. G. Widdows, C. S. Dauler, W. C. Jackson and E. C. Ryan. Space 178.

Electric Storage Battery Company, Philadelphia, Pa.—Storage batteries for car lighting, signal, automobile and ignition service. Represented by H. E. Hunt, D. P. Orcutt, Frank Kalas and J. R. Williams. Space 401.

Emery Pneumatic Lubricator Company, The, St. Louis, Mo.—Emery brake cylinder lubricant; Emery pneumatic lubricators for air brake equipment on locomotive and passenger cars. Represented by E. A. Emery, N. J. McAloney and Alex. Steiner. Space 626.

Enterprise Railway Equipment Company, Chicago, Ill.—Side dump hopper car; bottom dump ore car; bottom dump coal and coke car; side and center dump ballast car; center dump hopper coal car; bottom dump duplex hopper coal car. All 50-ton capacity. Represented by Argyle Campbell. Space on exhibit track.

Fairbanks Company, The, New York, N. Y.—Railroad track scales; platform scales; valves; dart unions and flangers. Represented by L. B. Mann, F. Mattern and F. Boraeson. Space 525.

Fairbanks-Morse & Company, Chicago, Ill.—Sectionalized No. 32 gasoline section motor car. Represented by A. A. Taylor, E. M. Fisher, C. T. Fugitt, W. W. Adams and F. H. Douglas. Space 584, 585.

Flannery Bolt Company, Pittsburgh, Penna.—Tate flexible staybolts; Tate adjustable crown stays; tools for applying Tate staybolts; "F. B. C." arch bar nut locks. Represented by J. Rogers Flannery, Jas. J. Flannery, Wm. M. Wilson, B. E. D. Stafford, Thos. R. Davis and Geo. E. Howard. Space 540, 542.

Forged Steel Wheel Company, New York, N. Y.—Forged Steel wheels. Represented by J. M. Hanson, J. B. Brady, R. L. Gordon, Wm. Libkemann, J. P. Rapp, H. G. Macdonald, J. E. Bradley, E. S. Keith and Howard Carlton. Space 28.

Forsyth Brothers Company, Chicago, Ill.—Various metal formations, including unit-sections for sides of cars; metal sash and doors; sash attachments and safety deck sash ratchets; cast steel yokes, with key connection, also drawbar radical and centering devices; high capacity buffing device and draft gears. Represented by George H. Forsyth, A. H. Sisson, Wm. Wampler and E. S. Taylor. Space 601, 545.

Ft. Pitt Malleable Iron Company, Pittsburgh, Pa.—Malleable iron castings. Represented by Frank J. Lanahan. Space 629.

Foster Company, The Walter H., New York, N. Y.—General selling agents for machine tools. Represented by Walter H. Foster and Herbert R. Kenah. Space 119-121.

Franklin Manufacturing Company, The, Franklin, Pa.—Franklin 85 per cent. magnesia boiler lagging and coverings and cements; asbestos supplies of all natures for railroad use; Franklin asbestos lumber smoke jacks. Asbestos "Carline." cotton and wool waste; perfection journal box packing; asbestos shingles, sheathing and corrugated. Represented by R. J. Evans, H. S. Hayden, L. B. Melville, E. R. Rayburn and H. S. Hayward. Space 26.

Franklin Railway Supply Company, New York, N. Y.—Franklin automatic fire door; grate shaker; flexible joint, between cars; water joint; flexible metallic roof. Represented by J. S. Coffin, S. G. Allen, R. G. Colburn, W. L. Allison, C. L. Winey, W. H. Coyle and J. L. Mohun. Space 412, 414.

Frost Railway Supply Company, The, Detroit, Mich.—Harvey friction spring gears; Detroit Metal Weather Strip. Represented by Harry W. Frost, George L. Harvey and George A. Cooper. Space 558.

Galena-Signal Oil Company, Franklin, Pa.—Reception Booth. Represented by E. H. Baker, W. A. Trubee, Geo. L. Morton, Wm. Holmes, W. J. Walsh, J. E. Hall, B. H. Grundy, C. C. Steinbrenner, E. V. Sedgwick, H. Hillyer, W. E. Augur, W. W. Breckenridge, W. E. Brumble, J. W. Bunn, J. A. Graham, E. W. Grieves, G. E. McVicar, W. E. Maher, A. V. Manchester, R. F. Menefee, C. G. Melvin, L. H. Palmer, W. O. Taylor, W. J. Vance and A. B. Wright. Space 38.

Garlock Packing Company, The, Palmyra, N. Y.—Throttle and air pump packings; superheat sheet packing; special packings for accumulators, compressors and general shop purposes. Represented by H. N. Winner, J. P. Landreth, T. P. Dunham, J. F. Franey and C. W. Brennan. Space 510.

General Electric Company, Schenectady, N. Y.—Motors, air compressor, controllers; rheostats; breast drills; steam and air flow meters; battery truck crane; ozonator; soldering irons; fans; headlights; arc lamps; 5 K. W. Curtis turbine; mercury arc rectifiers; cloth and steel pinions; ammeters; railway signal volt ammeter; cable display cabinet. Represented by J. G. Barry, C. E. Barry, W. B. Potter, A. W. Jones, J. W. Ham, C. D. Knight, Frank Rhea, R. E. Wooley, C. Fair, L. W. Shugg, R. A. Lewis, W. J. Clark, C. C. Pierce, W. O. Kellogg, C. A. Raymond, A. I. Totten, H. Schroeder and A. L. Broe. Space 350 to 363.

General Railway Supply Company, Chicago, Ill.—Working models of railway passenger car devices. Metallic (steel) sheathing; National steel trap doors; Perfection sash balances; Resisto insulation; Imperial car window screens; Flexolith composition flooring; National vestibule curtain catches; Eclipse deck sash ratchets; National standard roofing. Represented by H. U. Morton, W. L. Conwell, F. L. Wells, W. S. Humes and J. F. Oelerich. Space 570, 571.

Gilbert & Barker Manufacturing Company, Springfield, Mass.—Storage tanks with measuring and non-measuring pumps for the storage of lubricating and heavy paint oils; portable gasolene tanks for garages; underground storage tanks with measuring and non-measuring pumps for public and private garages; and specialties used in the handling of gasolene and oils. Represented by H. C. Worrall. Space.

Gold Car Heating & Lighting Company, New York, N. Y.—Gold's combination pressure and vapor system; straight vapor system; thermostatic temperature regulator; new ideal pressure regulator; cyclone ventilators; heat storage system for refrigerator cars; wedge lock steam hose couplers; electric heaters. Represented by Edward E. Gold, E. B. Wilson, A. B. Strange, F. A. Purdy, W. H. Stocks, A. D. Stuver, J. M. Stayman, George F. Ivers, F. H. Smith, E. J. Ronan, J. O. Brumbaugh, A. E. Robbins and F. O. Bailey. Space 301, 303, 305.

Goldschmidt Thermit Company, New York, N. Y.—Thermit of various kinds and appliances; metals and alloys produced by the alumino-thermic process; specimen pipe welds and apparatus for making same; motion pictures and transparencies to show the operations done by the Thermit process. Represented by Dr. Hans Goldschmidt, Wm. C. Cuntz, W. R. Hulbert, H. S. Mann, H. D. Kelley and J. G. McCarty. Space 333, 335.

Gould Coupler Company, New York, N. Y.—Gould "Simplex" system of electric train lighting. "Z" type of couplers—standard and special; "Z" type tender couplers; locomotive spring buffer; Gould friction striking plate buffer; friction draft gear; top and bottom operative passenger couplers; Gould "Z" type truck bolsters; malleable iron journal boxes; Gould truck side frame. Represented by F. P. Huntley, Geo. G. Milne, Dr. C. W. Gould, Clarence E. Rood, Geo. S. Berger and W. F. Richards. Space 574, 575.

Gould & Eberhardt, Newark, N. J.—One 24" new high power type, Eberhardt's patent doube triple quick stroke shaper arranged with adjustable speed motor, with automatic electrical starting and braking device One sectional frame and inside gearing of 16" shaper showing the interior construction. Represented by Fred L. Eberhardt, H. Ezra Eberhardt, Secretary and Chas. L. Cameron. Space 137.

Greene, Tweed & Company, New York, N. Y.—Palmetto packing, round and square, for high steam pressures; Palmetto packing, twist, for small globe valves, etc.; Palmetto packing in sets for railroad service; Manhattan packing for low steam and hydraulic pressures. Favorite reversible ratchet wrench. Represented by F. E. Ransley and L. J. Van De Wall. Space 590.

Greenlaw Manufacturing Company, The, Boston, Mass.—Flexible metallic hose for steam, air or oil between engine and tender, or between cars for steam and air. Flexible joints for roundhouse work and for car heating at terminals or car yards. Represented by H. A. Royce, W. A. Greenlaw and A. L. Greenlaw. Space 316, 318.

Griffin Wheel Company, Chicago, Ill.—Car wheels. Represented by C. P. Dennett, C. K. Knickerbocker, H. N. Scott, W. A. Bennett and A. A. Hale. Spaces 165, 167.

Grinden Art Metal Company, Brooklyn, N. Y.—Holow steel car doors; cold drawn steel mouldings. Represented by Wm. J. Grinden and Frank V. Grinden. Space 308.

Grip Nut Company, Chicago, Ill.—Grip nuts; monogram ladder fastenings; grip nut angle wrenches; grip holding nuts and metal dust guards. Represented by E. R. Hibbard, J. W. Hibbard, W. E. Sharp, W. G. Willcoxson, DeF. Lillis, Clifford Beaumont and Ben. Klein. Space 556, 557.

Halcomb Steel Company, Syracuse, N. Y.—Samples of crucible and electric welded steels; specimens of chrome vanadium steel. Represented by Dr. John Mathews, Thomas J. Moore, Thomas J. Moore, Jr., and Elmer Titus. Space 323.

Hale & Kilburn Company, Philadelphia, Pa.—Improved "Walkover" car seats, parlor car chairs, reclining chairs for cars, steel

car interior finish, steel doors for all kinds of steel cars, steel mouldings and car fittings. Represented by V. von Schlegell, R. H. Pilson, C. W. Laskay, J. G. Bower, I. Lubersky, A. F. Old, F. C. Edson and F. F. Robb. Space 408, 410.

Hammett, H. G., Troy, N. Y.—Trojan metallic packing; Trojan bell ringers; Trojan grinding compound; triple valve bushing rollers. Represented by H. G. Hammett, E. C. Sawyer and A. O. Van Dervort. Space 365.

Harringston, Son & Company, Inc., Edwin, Philadelphia, Pa.—Hand power traveling crane, geared and plain travelers on lower flange of I-beam, peerless spur geared hoist, improved screw hoist. Represented by W. J. Somerset, A. M. Harrington and Roger Sherron. Space 143, 145.

Hartshorn Company, Stewart, Newark, N. J.—Spring rollers for car curtains, vestibules and sash balances. Represented by B. E. Bushnell. Space

Hewitt, H. H., New York, N. Y.—One car truck, transom type, full size; one car truck, bolster type, full size; one engine tender truck, full size; also quarter-size models—one car truck, transom type; one car truck, bolster type; one engine tender truck, one six-wheel passenger truck. Represented by H. H. Hewitt, M. S. Paine, S. J. Sill and C. M. Bower. Space 179, 181, 183.

Heywood Brothers and Wakefield Company, Wakefield, Mass.—Seats for railway coaches, including new type of pressed steel armrest, also seats for interurban and city cars. Represented by Bertram Berry, Scot Wade, C. W. H. Frederick and E. C. Lang. Space 624.

Higley Machine Company, New York, N. Y.—No. 25 (28-in. blade) Higley cold metal saw. Represented by C. H. Hamersly. Space 147.

Home Rubber Company, Trenton, N. J.—Rubber Mechanical Goods. Represented by A. R. Foley. Space 375.

Hubbard & Company, Pittsburgh, Pa.—Railroad track tools, track shovels, locomotive scoops, pole line hardware, Pierce insulator pins and brackets, standard and special washers, steel stampings. Represented by John W. Hubbard, John J. Brooks and R. L. Mason. Space 402.

Hunt Company, C. W., West New Brighton, N. Y.—Coal handling machinery, motion picture of cargo cranes, P. R. R. at Greenville, N. J.; automatic railway model, industrial railway, train of cars; coaling station model, gravity bucket conveyor model, hoisting and transmission rope, photos of coal-handling plants and machinery. Represented by A. C. Summers, J. Day Flack, J. P. Mewshaw and R. E. Boller. Spaces 169, 171, 173, 175.

Hunt-Spiller Manufacturing Corporation, South Boston, Mass.—Eccentrics, straps, driving boxes, shoes and wedges, crosshead shoes, guides, superheater headers, false valve seats, side rod bushings, cylinder packing, cylinder bushings, pistons, piston valve cages, piston valve packing, air pump cylinder bushings and packing, knuckle pin bushings. Represented by W. B. Leach, Frederick Parker, J. G. Platt, V. W. Ellet and J. M. Monroe. Space 560, 561.

Illinois Steel Company, Chicago, Ill.—With Carnegie Steel Company. Spaces 418, 546, 547.

Independent Pneumatic Tool Company, Chicago, Ill.—Thor pistol corner motors, air grinders, a new two-piece long stroke ton air drills, pneumatic hammers, stay bolt drivers, close-riveting hammer, electric drills. Represented by James B. Brady, W. O. Jacquette, John D. Hurley, F. W. Buchanan, R. S. Cooper, George A. Gallinger, R. T. Scott, J. J. Keefe, J. P. Bourke, T. J. Carroll, H. F. Finney, W. R. Gummere, H. H. Hendricks, W. A. Johnson, G. J. Lynch, F. J. Passino, V. W. Robinson, C. B. Ross and Geo. C. Wilson. Space 587, 589.

Industrial Requirements Company, Philadelphia, Pa.—Leather material. Represented by E. Boyd Weitzel. Space 142.

International Oxygen Company, New York, N. Y.—I. O. C. system generators for producing pure oxygen and hydrogen; Victor oxyhydrogen torches; Eyeosee oxy-acetylene torches; Holder pressure acetylene generators; I. O. C. oxygen, hydrogen and acetylene regulating and reducing valves. Represented by E. W. Irwin, H. L. Barnitz, A. A. Heller and I. H. Levin. Space 307.

Jacobs-Shupert U. S. Fire Box Company, The, Coatesville, Pa.—One Jacobs-Shupert fire box and back end complete with straight side sheets. One Jacobs-Shupert fire box and back end complete of the "O. G." type of side sheets. One Jacobs-Shupert fire box (inside shell only). Throat sheets fire box setcions, stay sheets, etc., in their various stages of development. Samples of special flanging work. Represented by A. F. Huston, C. L. Huston, W. H. Hamilton, P. R. Baker, Mr. Goodfellow, C. Ducas, A. W. Whitford and C. H. Coleman. Space 180, 182.

Jenkins Bros., New York, N. Y.—Brass, iron and steel valves of all types for power plants, railroad shops and equipment, heating and water systems. Sheet packing, pump valves and other mechanical rubber goods for railroad work. Represented by B. J. Neely, C. B. Yardley, Jr., and Alfred Engle. Space 610, 612.

Jerguson Gage & Valve Company, Boston, Mass.—Locomotive gages. Represented by Geo. L. Huntress. Space 327.

Jessop & Sons, Incorporated, William, New York, N. Y.—Specimens of Jessop's crucible steel; various grades and manufactured articles made from same. Represented by John E. Sandmeyer, O. H. Reynolds, E. M. Britton and T. S. Hanna.

Johns-Manville Company, H. W., New York, N. Y.—Refrigerator and steel passenger car insulation; waterproofing and mastic samples; electrical materials; air pump packings; Vitribestus pipe coverings; high and low pressure pipe coverings; train pipe coverings; wool felt roofing; car roofing; asbestos roofing; throttle and steam hammer packings; Transite asbestos shingles; smoke jack; ebony asbestos wood; ventilators; fire resisting cements; asbestos car sill covering; friction tapes and splicing compounds; packings; gaskets; diaphragm canopy covers; locomotive laggings; indurated fibre conduit for electric wiring; Sanitor toilet seats. Represented by J. E. Meek, G. A. Nicol, C. W. Gearhart, J. H. Trent, F. J. Horne, J. C. Younglove, H. G. Newman, C. E. Murphy, P. C. Jacobs and G. Christenson. Space 580, 581.

Joliet Railway Supply Company, Chicago, Ill.—"Huntoon brake beams," standard M. C. B. No. 1 and No. 2 freight beams; standard passenger and tender beams and beams for "high speed" and P. C. air brake equipment. Perry roller side bearings for passenger, freight and interurban cars and locomotives. Perry-Hartman self-centering anti-friction radial truck. Represented by E. A. Laughlin, A. G. Bancroft, Jos. D. Granville and Jos. F. Leonard. Space 541, 543.

Jones & Laughlin Steel Company, Pittsburgh, Pa.—Open hearth and Bessemer steel, rounds, flats, squares, hexagons, bars, plates, etc. Steel sheet piling; power transmission machinery; cold rolled teel shafting; concrete reinforcing bars; chains; steel wire nails; tinplate; barbed wire; various wire products, including screw stock, railroad spikes, light rails and connections. Structural steel, beams, angles, channels. Represented by J. K. Barker, C. S. Bradley, G. C. Fogwell, Robert Geddis, Roland Gerry, T. C. Ham, H. F. Holloway, R. M. Kilgore, A. B. Marble, George B. Mitchell, W. T. Mossman, A. C. Pollock and Frank S. Slocum. Space 407.

Joyce-Cridland Company, The, Dayton, Ohio.—Jacks. Represented by Geo. M. Llewellyn, Chas. D. Derby, P. J. Ford and W. Irving Clark. Space 524, 526.

Keyoke Railway Equipment Company, Chicago, Ill.—Space 321.

Keystone Drop Forge Works, Chester, Pa.—Keystone connecting links; Keystone safety shackle hooks. A full line of standard and special drop forgings. Represented by Geo. H. Berlin, Chas. F. H. MacLaughlin and Wm. J. McDevitt. Space 512.

Keystone Lubricating Company, Philadelphia, Pa.—Keystone locomotive journal box; various densities; Keystone grease. Represented by A. C. Buzby, H. A. Buzby, W. F. Buzby, W. E. Harrington, T. O. Organ, C. A. Hopper and J. T. Butler. Space 154, 156.

Knight Pneumatic Sander Company, Huntington, Ind.—Sanders for locomotives and interurban equipment. Represented by R. G. Mitchell and Daniel Shaeff. Space 632.

Landis Machine Company, Waynesboro, Penna.—1½" double head motor driven bolt cutter; 2" double head motor driven bolt cutter with lead screw; automatic die heads for turret lathes and screw machine; solid adjustable die heads for screw machines; pipe die heads for pipe threading machines; different styles and types of dies; samples of threaded product. Represented by H. L. Fisher, Ira D. Grove, Carl F. Meyer and J. W. Willis. Space 123.

Lehon Company, The, Chicago, Ill.—Roofing and insulating papers. Represented by Thomas Lehon. Space 18.

Locomotive Improvement Company, The, Clinton, Iowa.—Full sized driving box, showing Markel's removable driving box, brass and lateral motion plates; model showing flangeless shoes and wedges; models showing solid head rod, front and back ends; drawing of rod, full sized. Represented by L. W. Barker and E. J. Fuller. Space 13.

Locomotive Superheater Company, New York, N. Y.—Model of Schmidt top header type superheater. Model showing method of setting superheater flues in boiler. Model of superheater unit. Represented by Simon Hoffmann, George L. Bourne, Gilbert E. Ryder and William Boughton. Space 412, 414.

Lucas Machine Tool Company, Cleveland, Ohio.—No. 33 "Precision horizontal boring, drilling and milling machine. Represented by W. L. Cheney and J. A. Leighton, Jr. Space 106.

Lunkenheimer Company, The, Cincinnati, Ohio.—Regrinding, renewo, ferrenewo, globe, angle and cross valves; iron body, puddled semi-steel, crucible cast steel globe angle and cross valves; non-return boiler stop valves; victor gate valves; pop

valves; lubricators; stop cocks, etc. Represented by Lane Thompson and Elmer Ritter. Space 532, 534.

McConway & Torley Company, The, Pittsburgh, Pa.—Buhoup flexible truck; Buhoup 3-stem passenger coupler; Pitt passenger coupler; Janney passenger coupler; Penn freight-coupler, with overhead and underneath release; steel castings. Represented by Stephen C. Mason, E. M. Grove, H. C. Buhoup and I. H. Milliken. Space 501, 503, 505.

McCord & Company, Chicago, Ill.—McCord malleable iron and vanadium cast iron journal boxes for freight, passenger and engine tender equipment; draft gear; spring dampener; force feed locomotive lubricator in operation. Represented by Morrill Dunn, J. A. Lamon, W. J. Schlacks, R. L. McIntosh, H. E. Creer, A. C. McCord and H. S. Whitehair. Spaces 511-513.

McCord Manufacturing Company, Chicago, Ill.—Universal window fixtures, consisting of flexible weather stripping; metal weather stripping; gravity wedging sash locks and racks; two new types of locks; sash balances; deck sash ratchets; copper insulated adjustable sash; sash lifts; McCord Universal air hose protector; drawn metal mouldings. Represented by Benjamin S. McClellan and Robert A. Flum. Space 507, 509.

McCuen, J. P., Cincinnati, Ohio.—Car Couplers. Represented by J. P. McCuen. Space 182.

McGraw Publishing Company, New York, N. Y.—Copies of Electric Railway Journal, Electric Railway Dictionary, Electric Railway Directory, Electric Railway Manual, Electrical World Engineering Record. Views of offices and printing plant. Represented by Hugh M. Wilson, D. T. Pierce, Henry W. Blake, Walter Jackson, Frank Kingsley, C. A. Babtiste, W. K. Beard, Harold Rudd and Joseph A. Kucera. Space 7.

Main Belting Company, Philadelphia, Pa.—A specially constructed and treated belt for car lighting purposes. Represented by W. E. Fawcett and O. K. West. Space 188.

Manning, Maxwell & Moore, Inc., New York, N. Y.—Will be representative Hendey lathes, shapers, milling machines, Gridley automatic machines, Cincinnati gear cutters and crank planers, Reed engine lathes, National heading machines; also a comprehensive exhibit embracing Hancock locomotive inspirators, check valves, steam valves and hose strainers, Consolidated locomotive pop safety valves and Ashcroft steam gauges. Represented by Frank P. Smith, James B. Brady, P. M. Brotherhood, Kester Barr, Robert A. Bole, W. H. McIntyre, J. N. Derby, H. P. Eilers, L. H. Mesker, M. A. Sherritt, Joseph H. Bush, John J. Faas, Charles L. Brown, A. J. Babcock, Thos. Stephens, W. H. Williston, F. C. Blanchard and B. T. Williston. Space 108 to 132.

Manufacturers' Exhibit of Railway Supplies, Chicago, Ill.—Represented by W. N. Mitchell and R. S. Mitchell. Space 527.

Massachusetts Mohair Plush Company, Boston, Mass.—Car seats of various manufacturers. Samples of all qualities of plain and figured plushes. Represented by W. W. Melcher. Space 22.

Mid-Western Car Supply Company, Chicago, Ill.—Steel underframe in combination with body and truck bolster; Anderson friction draft gear; Mid-Western key yoke attachment, and spring and friction buffer block on exhibit track. Anderson friction draft gear type "A" and "B." Represented by J. E. Forsyth, Geo. E. Pratt and A. L. Jacobs. Space 328.

Midvale Steel Company, The, Philadelphia, Pa.—One 33" steel tired wheel, bolted type of fastening, rolled steel center; one 33" steel tired wheel, bolted type of fastening, cast iron spoke center; one 33" rolled steel freight wheel; one 36" rolled steel coach wheel; one-heat treated driving axle. Represented by H. M. Doomer, D. Vincent Foster, Guilliam Aertsen, Ernest Harrah, T. W. Illingworth, A. E. Goodhue, Chas. Tietze, Col. Thompson, J. Bradley Patterson and W. S. Edger. Space 640.

Milburn Company, The Alexander, Baltimore, Md.—Milburn standard oxy-acetylene welding and cutting outfit complete, especially adapted to steam railroad practice. The steam acetylene generator headlight, a device utilizing waste steam, lighting the headlight by acetylene gas. Milburn lamps, portable acetylene construction, wrecking and inspection lights. Represented by C. R. Pollard, Jr., W. M. McCauley and Fredk. M. Maley. Space 208, 210.

Moran Flexible Steam Joint Company, Louisville, Ky.—Flexible joints for steam, air, gas and liquid automatic barrel fillers. Represented by Thomas W. Moran and C. H. Jenkins. Space 207.

Mudge & Company, Burton W., Chicago, Ill.—Garland car ventilators; Garland refrigerator car door fastener. Represented by Burton W. Mudge, Herbert Green, Robert M. Smith and George W. Bende. Space 400.

Murphy Equipment Company, New York, N. Y.—Forged truck frame. Space on exhibit track.

Nathan Manufacturing Company, New York, N. Y.—Injectors; lubricators; boiler washer and tester; steam fire extinguisher; Klinger water gauges; Hart blower valves; Hart globe and angle valves. Represented by Alfred Nathan, Edward S. Toothe, J. C. Currie, Otto Best, Chas. R. Kearns, J. S. Seeley, L. Kassander, N. W. Anthony and Edward Laterman. Space 578, 579.

National Boiler Washing Company, Chicago, Ill.—Boiler washouts systems. Represented by W. W. White. Space 4.

National Lock Washer Company, The, Newark, N. J.—National lock washers; car curtains; curtain fixtures; sash locks; sash balances. Represented by F. B. Archibald, R. L. Brown, W. C. Dodd, J. H. Horn and D. Hoyt. Space 533, 535.

National Malleable Castings Company, The, Cleveland, Ohio.—Couplers; brake staff mechanism; malleable iron castings. Represented by F. R. Angell, T. Aishton, C. A. Bieder, W. E. Coffin, C. Gasper, R. T. Hatch, H. D. Hammond, J. H. Jaschka, C. L. Johnston, G. V. Martin, J. H. Merrill, Benj. Nields, Jr., R. H. Pilson, J. H. Slawson, J. A. Slater, L. S. Wright, G. F. Wilhelmy and E. O. Warner. Space 613, 615.

National Tube Company, Shelby Steel Tube Company, Pittsburgh, Pa.—Hot-rolled locomotive tubes; superheated tubes; Kewanee unions; N. T. C. regrinding valves. Represented by G. N. Riley, P. J. Conrath, O. H. Kelly, J. T. Goodwin, J. A. Dillon, J. O. Ramsey, L. R. Cummings, J. G. Bateman, W. S. Bitting, J. E. Fleming, J. J. Kennedy, B. F. Bart.

Nelite Work of General Electric Company, Cleveland, Ohio.—Complete line of lighting units for all types of car lighting service and lighting units for all classes of industrial and shop lighting, office, station, waiting-room and platform lighting. Represented by Arthur J. Sweet, L. C. Doane and N. B. Hazeltine. Space 337.

Newhall Engineering Company, George M., Philadelphia, Pa.—Photographs of wrecking, locomotive and transfer cranes, pile drivers, etc., built by Industrial Works, Bay City, Michigan. Photographs of electric overhead traveling cranes built by Case Crane Company, Columbus, Ohio. Represented by David Newhall, Morton L. Newhall, A. F. Baumgarten, William L. Brown and William Waring. Space 386, 387.

Newton Machine Tool Works, Philadelphia, Pa.—Internal cutting, cold saw cutting-off machine. Represented by H. W. Champion, N. P. Lloyd and H. W. Brown. Space 139, 141.

New York Air Brake Company, The, New York, N. Y.—Exhibition rack representing the electro-pneumatic brake equipment for a locomotive and ten cars. This includes a steam driven generator from which the current is obtained. A new triple valve for freight service is shown in section. Represented by H. F. Bickel, W. T. Henry, C. E. Leach, B. J. Minnier, B. Pratt and F. M. Whyte. Space 330 to 338.

Nickel Chrome Chilled Car Wheel Company, Pittsburgh, Pa.—Two 33-inch nickelized chilled car wheels. Represented by Robert C. Totten and Stephen D. Barnett. Space 519.

Niles-Bement-Pond Company, New York, N. Y.—Niles new model car wheel borer, Pond reversing motor drive planer. Represented by James K. Cullen, George F. Mills, Charles L. Lyle, J. T. McMurray and Edward L. Leeds. Space 100.

Norton Company, Worcester, Mass.—Complete display of Norton grinding wheels from the small wheels for internal grinding, a fraction of an inch in diameter, to the large, heavy coarse wheels used for grinding steel and iron castings, wheels, axles, etc. An attractive collection of photographs of the Norton car axle grinding machine. Medical exhibit. Represented by E. W. Dodge, Carl F. Dietz, Geo. W. Thomson and Geo. S. Welker. Space 144, 146.

Norton Grinding Company, Worcester, Mass.—Car axles and car wheels ground on the Norton grinding machine. Grinding machines and parts equipped with protecting devices. Represented by C. O. Smith, Charles H. Norton and H. N. Cudworth. Space 144, 146.

Norton, Inc., A., Boston, Mass.—Various types of jacks. Space 607.

O'Malley-Beare Valve Company, Chicago, Ill.—Multi-plate valves and parts. Represented by Edward O'Malley and Thomas O'Malley. Space 218.

Oxweld Acetylene Company, Chicago, Ill.—Oxy-acetylene and oxy-hydric welding apparatus in operation cutting metal twenty-four inches thick. A demonstration of the welding of a complete set of boiler tubes into the flue sheet. Represented by W. J. Knapp, G. E. Kershaw, W. J. Fritz, C. B. Moore and J. A. Warfel. Space in the Acetylene Annex, 3-4 Pier End.

Pantasote Company, The, New York, N. Y.—Pantasote car curtains and upholstery. Agosote headlinings and interior trims for passenger cars. Represented by John M. High, W. A. Lake and A. S. Barrows. Space 404, 406.

Parkesburg Iron Company, The, Parkesburg, Pa.—Charcoal iron boiler tubes. Represented by H. A. Beale, Jr., W. H. S. Bate-

man, C. L. Humpton, H. C. Hunter, J. A. Kinkead, L. P. Mercer, J. H. Smythe and George Thomas, 3d. Space 388.

Parsons Engineering Company, Wilmington, Del.—Parsons system of combustion applied to a locomotive fire box. Full size steel model made in section. Space 514.

Pease Company, The C. F., Chicago, Ill.—The Pease peerless blue printer with automatic washing and drying machine; Pease peerless direct blue line equipment; Simplex blue print paper coating machine; motor driven trimming table. All in operation. Represented by C. F. Pease, P. M. Morgan, T. K. Murney and J. J. Newlin. Space 170.

Pennsylvania Flexible Metallic Tubing Company, New York, N. Y.—Metal hose and flexible metallic tubing for conveying air, steam, water, gas and oil; flexible copper hose for connecting locomotive to boiler washing line. Also blower connection to locomotive. Represented by J. M. Odenheimer, C. A. Meyer and B. C. Willis. Space 312, 314.

Pilliod Company, The, Swanton, Ohio.—Model of Baker locomotive valve gear. Represented by R. H. Weatherly, F. S. Wilcoxen, K. J. Eklund, R. G. Graham, R. F. Darby, C. M. Jennelle and F. E. Pilliod. Space 562, 563.

Pittsburgh Steel Foundry Company, Pittsburgh, Pa.—Two cast steel truck side frames interlocking into cast steel journal boxes with an interlocking cast steel spring plank. Represented by H. V. Seth, O. S. Pulliam and John Allison. Space 611.

Pneumatic Jack Company, Inc., Louisville, Ky.—Tandem cylinder pneumatic jacks; car and roundhouse jacks; locomotive jacks, standard and special journal jacks. Represented by L. J. Dittmar and J. S. Leake. Space 376.

Pocket List of Railroad Officials, The, New York, N. Y.—Pocket List of Railroad Officials. Represented by J. Alexander Brown, Harold A. Brown and Chas. L. Dinsmore. Space 7.

Pressed Steel Car Company, New York, N. Y.—Photographs of product in booth. Represented by J. C. Anderson, L. O. Cameron, O. C. Gayley, H. S. Hammond, C. A. Lindstrom, J. F. MacEnulty, J. H. Mitchell, C. E. Postlethwaite, N. S. Reeder, J. H. Regan, M. S. Simpson, J. S. Turner and W. H. Wilkinson. Space 620.

Pyle-National Electric Headlight Company, Chicago Ill.—Pyle-National latest type "E" electric turbo generator set for locomotive electric headlights. Represented by R. C. Vilas, H. P. Bayley, M. A. Ross, I. Will Johnson, C. P. McGinnis and Chas. W. Drake. Space 537.

Pyrene Manufacturing Company, New York, N. Y.—Pyrene fire extinguisher in three styles, enameled, brass and nickel plated. Represented by E. M. Davidson, George H. Peterson and Thomas Areson. Space 201.

Quigley Furnace & Foundry Company, Springfield, Mass.—Drawings of the Quigley furnaces. Represented by C. K. Lasseter, W. S. Quigley and W. G. Ferguson. Space 121.

Railway Age Gazette, New York, N. Y.—Publishers of the Railway Age Gazette, American Engineer and Railway Journal, Signal Engineer, Daily Railway Age Gazette and books on the subject of steam transportation. Represented by E. A. Simmons, L. B. Sherman, Samuel O. Dunn, Bradford Boardman, C. R. Mills, Henry Lee, Roy V. Wright, William Forsyth, R. E. Thayer, F. S. Dinsmore, W. E. Hooper, E. S. Faust, W. W. Newcomb, A. E. Hooven, T. F. Crossman, F. H. Thompson, E. A. Averill, W. D. Horton, K. G. Cloud and Miss Gegen. Space 1.

Railway Electrical Engineer, Chicago, Ill.—Railway publication. Represented by Edward Wray. Spaces 625-627.

Railway List Company, The, Chicago, Ill.—Railway Master Mechanic, Monthly Official Railway List; Railway Engineering and Maintenance of Way. Represented by William E. Magraw, Chas. S. Myers, L. F. Wilson, J. M. Crowe and O. W. Middleton. Space 35.

Railway Materials Company, Chicago, Ill.—Steel back brake shoes and Ferguson shop furnaces. Represented by T. B. Cram, E. C. Folsom, Geo. Hoeffle, C. M. Mendenhall, J. F. Schurch and W. M. Simpson. Space 559.

Railway Utility Company, Chicago, Ill.—Exhaust ventilators; intake ventilator and air washer; gas lamp jack; oil lamp jack; thermostatic control of car heating with steam, electricity and hot water systems; steam hose couplers; locomotive equipment with flexible metallic joints; automatic freight car door locks; electric vacuum car cleaners. Represented by Wm. J. Pine, Lee P. Hynes, E. J. Magerstadt, J. P. Gallagher, C. A. Luckey and E. R. Field. Space 617.

Railway & Engineering Review, Chicago, Ill.—Railway newspapers. Represented by Willard A. Smith, P. G. Stevens and Harold A. Smith. Spaces 12-14.

Ralston Steel Car Company, Columbus, Ohio.—Steel car on exhibit track. Represented by Jas. S. Ralston, A. A. McAdam, W. T. Sheldon and F. E. Symons. Space on exhibit track.

Reliance Electric and Engineering Company, Cleveland, Ohio.—Reliance adjustable speed motors; Oesterlein motor-driven milling machine; D. C. & A. C. constant speed motors; motor headstocks for woodworking lathes. Represented by H. M. Hitchcock, D. G. Darling, A. W. Ray, E. A. Lewis and S. C. Potter. Space 134, 136.

Remy Electric Company, Anderson, Ind.—The American Electric Headlight. Represented by T. B. Arnold, G. V. Bain, H. W. Griffith and L. A. Darling. Space 205.

Restein Company, Clement, Philadelphia, Pa.—Locomotive air pump packing; throttle steam packing; locomotive steam way packing; steam hammer packing; hand hole and man hole gaskets; tender hose; steam hose; flexible metallic connections for between engine and tender. Represented by H. O. Fettinger, Norman B. Miller and W. J. Cromie. Space 16.

Richmond Staybolt Drilling Machine Manufacturing Company, Richmond, Va.—A staybolt drilling machine. Represented by E. W. Fishburne. Space 138.

Robinson Coupler Company, The, Washington, D. C.—The Robinson automatic air and steam hose connector. Represented by Clinton M. Smith. Space 32.

Rochester Germicide Company, Rochester, N. Y.—Disinfectants; perfection drinking fountains; liquid soap and urns; sanitary paper towels; sanitary supplies. Represented by C. S. Whitman. Space 382.

Rubberset Company, Newark, N. J.—General line of Rubberset paint brushes and products of the Rubberset Company. Represented by A. L. Holtzman. Space 536.

Safety Car Heating and Lighting Company, New York, N. Y.—Pintsch car lighting system; safety electric axle dynamo lighting system; thermo jet car heating system; Pintsch and electric car lighting fixtures; steam traps, valves, etc.; indirect lighting fixtures; hot water car heating system. Represented by R. M. Dixon, J. A. Dixon, A. C. Moore, J. S. Henry, Geo. E. Hulse, E. E. Allbee, Wm. L. Garland, Chas. B. Adams, J. G. Van Winkle, Wm. St. John, Geo. H. Chadwell, M. F. Elliott, R. H. Harvey, A. B. Mills, R. C. Shaal, L. Schepmoes, J. M. Towne and W. I. Thompson. Space, platform on pier.

Sargent Company, Chicago, Ill.—E. S. E. blow-off valve; iron-clad water glass protector; "Klinger" reflex gauges; E. S. E. water glass cock; Osborne valves. Represented by Frank G. Dunbar and George H. Sargent. Space 529.

Scarrett-Comstock Furniture Company, St. Louis, Mo.—Coach seats; reclining chairs for coaches. Space 20.

Scullin-Gallagher Iron & Steel Company, St. Louis, Mo.—Six-wheel passenger car truck frame; two complete trucks showing types of truck side frames with divided journal box; double body bolster. Represented by Frank L. Norton, G. L. L. Davis, H. H. Waldron, R. A. Dugan and L. A. Shepard. Spaces 153 to 159.

Sellers & Company, Wm., Incorporated, Philadelphia, Pa.—Locomotive injectors and accessories; drivers as used upon face plates, and turret rest, of extra high power locomotive driving wheel lathe; drivers as used upon face plates, and turret rest, of extra high power car wheel lathe; hangers, couplings, bearings, for the transmission of power. Represented by Strickland L. Kneass, John D. McClintock, Charles T. Wilson, Clinton B. Conger and Walter W. Storm. Space 623.

Shelby Steel Tube Company.—In space 548 with the National Tube Company.

Simplex Railway Appliance Company, Chicago, Ill.—In space 185, 186 with American Steel Foundries.

Sinclair Company, Angus, New York, N. Y.—Railway newspapers. Represented by Angus Sinclair. Space 33.

Sprague Electric Works of the General Electric Company, New York, N. Y.—Steel armored air brake hose; steel armored car heating hose; steel armored hose for shop use; steel armored hose fittings; flexible steel conduit; Greenfielduct rigid conduit; flexible steel armored cable; outlet boxes and conduit fittings; electric fans and electric hoists. Represented by A. E. Braddell, F. W. Hall, H. H. Hornsby, C. Johnson and H. W. Uhl. Space 379, 381.

Standard Car Truck Company, Chicago Ill.—One full-size flat car equipped with roller bearing lateral and radical motion trucks. Barber roller center plate. Represented by J. C. Barber, F. L. Barber and James T. Milne. Space on exhibit track.

Standard Coupler Company, New York, N. Y.—Standard steel platforms; couplers; Sessions-Standard friction draft gears. Represented by Geo. A. Post, A. P. Dennis, E. H. Walker, R. D. Gallagher, Jr., and Geo. A. Post, Jr. Space 31.

Standard Roller Bearing Company, Philadelphia, Pa.—Roller bearing car journal boxes, assembled and dis-assembled; steel balls; journal roller bearings; agricultural roller bearings; roller motor bearings; standard taper roller bearings; roller thrust bearings; ball thrust bearings; grooved ball end thrust bearings; annular ball bearings and special anti-friction bearings. Represented by R. S. Woodward, F. M. Germane, Charles H. Machen, J. G. Cooley and M. G. Sperzel. Space 304.

Standard Steel Car Company, New York, N. Y.—Represented by J. M. Hanson, J. B. Brady, Wm. Libkeman, R. L. Gordon, H. G. Macdonald, J. P. Rapp, J. E. Bradley, E. S. Keith and Howard Carlton. Space 28.

Steel Specialties Company, Boston, Mass.—Worth wedge washer or nut safe-guard. Represented by A. L. Cole and J. W. Dana. Space 184.

Storrs Mica Company, Owego, N. Y.—Samples mica headlight chimneys and mica lantern globes; also samples Thompson indestructible hose clamp for use on air brake, air signal, steam and locomotive feed water house. Represented by A. P. Storrs and Charles P. Storrs. Space 591.

Street, Clement F., Schenectady, N. Y.—One Street locomotive stoker. Represented by Clement F. Street, T. R. Brown, N. M. Lower and Chas. F. Gernert. Space 403, 405.

Symington Company, The T. H., Baltimore, Md.—Symington journal boxes, Farlow draft gear. Represented by T. H. Symington, C. J. Symington, W. W. Rosser, E. H. Symington, I. O. Wright, B. S. Johnson, T. C. de Rossett, M. K. Kimberly, A. H. Weston and D. F. Mallory. Space 568, 569.

Tabor Manufacturing Company, The, Philadelphia, Pa.—Inserted tooth saws. Represented by H. W. Brown and Wm. J. Knoz. Space 139. 141.

Templeton, Kenly & Compan··· L't'd, Chicago, Ill.—Coach, locomotive and truck jack. Represented by W. B. Templeton and Arthur C. Lewis. Space 621.

Topping Brothers, New York, N. Y.—Ball bearing jacks, high speed jacks; pillow blocks; "Perfect" universal joints; spring winders. Represented by William E. Hansen and Charles L. Crabb. Space 608.

Transportation Utilities Company, New York, N. Y.—Vestibule diaphragms, curtains, diaphragm attachments, weather-proof windows, interior car curtains, steel doors and ladders, Chanarch car flooring, weather-proof window posts. Represented by W. L. Conwell and H. B. Chamberlain. Space 572, 573.

Tyler Company, The W. S., Cleveland, Ohio.—Draftac spark arrester netting; square mesh spark arrester neeting; copper, brass, galvanized, iron and steel wire cloth for car work; testing sieves. Represented by M. P. Reynolds, W. P. Cahall and L. D. Winters. Space 531.

Union Draft Gear Company, Chicago, Ill.—Cardwell friction draft gears, small drop demonstrating machine. Represented by J. R. Cardwell, L. T. Canfield, W. G. Krauser, J. E. Tarelton and J. W. Hathaway. Space 409.

Union Spring & Manufacturing Company, Pittsburgh, Pa.—Coil and elliptic springs; pressed steel box lids; steel castings; Kensington all steel journal boxes; pressed steel spring plates; cast steel journal box. Represented by A. M. McCrea, L. G. Woods, H. B Darlington, Chas. S. Foller, A. C. Woods, T. B. Arnold, W. F. LaBonta and H. F. Ayres. Space 528, 530.

Universal Draft Gear Attachment Company, Chicago, Ill.—Cast steel draft arms; twin spring draft gear; cast steel keyed type drawbar yokes; cast steel riveted type drawbar yokes. Represented by C. J. Nash and C. C. Kinsman. Space 34.

United States Light & Heating Company, The.—New York, N. Y.—Axle light equipment, stationary and vehicle batteries, electric starters for gasoline trucks and vehicles; complete assortment of parts and partly assembled apparatus. Represented by W. P. Hawley, D. W. Pye, I. Allen Smith, W. L. Bliss, A. W. Donop, L. S. Cunny, J. A. White, William Bauer, C. W. Bradford and W. G. Davis. Space 320 to 326.

U. S. Metal & Manufacturing Company, New York, N. Y.—Reception Booth. Represented by B. A. Hegeman, Jr., Chas. C. Castle, E. D Hillman, F. C. Dunham, H. A. Hegeman, J. J. Ross and H. K. Porter. Space 622.

United States Metallic Packing Company, The, Philadelphia, Pa.—United States metallic piston rod, valve stem, and air pump rod packings for locomotives, of both King and Multiangular type; Leach pneumatic track sander; Gollmar pneumatic bell ringer; indestructible oil cup, etc. Represented by Morris B. Brewster, C. B Ford, Elliott Gurtiss, John S. Mace, Harry M. Wey and C. L. Mellor. Space 517.

United States Metal Products Company, New York, N. Y.—Steel doors, trim and sash for steel coaches; car seats. Represented by S. A. Walker. Space 176.

Valentine & Company, New York, N. Y.—"Valspar," a waterproof varnish; their system of car painting. Represented by Langdon R. Valentine, Lawson V. Pulsifer, I. H. Munford and J. E. Ham. Space 522.

Van Dorn & Dutton Company, The, Cleveland, Ohio.—Hard service portable electrically operated drills and reamers. Represented by Franklin Schneider, F. W. Sinram, A. K. Baxter and A. N. Frecker. Spaces 133, 135.

Virginia Equipment Company, Toledo, Ohio.—Dust guards. Represented by Lacy Y. Williams and Grafton A. Dodd. Space 377.

Vixen Tool Company, Philadelphia, Pa.—Vixen files and rail planers. Represented by Walter D. Craft and H. Rawcliffe. Spaces 164, 166.

Ward Equipment Company, New York, N. Y.—Car heating apparatus; passenger car ventilators; yard plugs and car receptacles for charging storage batteries on electrically lighted cars; Ward steam couplers; end train pipe valves; Unotherms; improved car heating material of all kinds. New equipment for locomotives using exhaust steam from the air brake pump for heating passenger trains. Represented by George B. Culver, J. F. Deems, Peter Fink, Charles E. Lowell, Rolland B. Lowther, C. F. McCuen, Lewis B. Rhodes, Lewis B. Rhodes, Jr., E. C. Post, Walter B. Van Beuren, John E. Ward and A. L. Whipple. Spaces 550, 551.

Warner & Swasey Company, The, Cleveland, Ohio.—One No. 3A universal hollow hexagon turret lathe bar capacity 3¼" chucking capacity 15". Represented by R. G. Buyer, C. J. Stilwell and F. B. Castle, demonstrator. Spaces 161, 163.

Watson-Stillman Company, New York, N. Y.—Space 538.

Welsbach Company, Gloucester, N. J.—Incandescent gas lamps and mantles for railway stations, shops, etc. Represented by Townsend Stites, Alphonso Mason, Chas. W. Wardell, Fred. N. Hamerstrom, Thomas J. Litle, Jr. and Elmer L. Knoedler. Spaces 40, 42.

West Disinfecting Company, New York, N. Y.—Disinfectants and disinfecting appliances; West liquid soap dispensers and Beau Brummell liquid soap; fumigating apparatus; paper towels; Pipe Klen-Zo. Represented by Mr. Geo. L. Lord and Mr. H E. Daniels. Space 516.

Western Railway Equipment Company, St. Louis, Mo.—Models of Acme automatic brake adjuster; Western sill and carline pockets; steel carline; brake jaws; pipe clamps; interchangeable bearing and wedge. Represented by Louis A. Hoerr, Sterling Campbell and R. L. Langtion. Space 370 to 373.

Western Steel Car & Foundry Company, New York, N. Y.—Photographs in booth. Space 620.

Westinghouse Air Brake Company, Pittsburgh, Pa.—Reception Booth. Represented by A. L. Humphrey, E. A. Craig, Robert Burgess, T. L. Burton, Jos. R. Ellicott, F. V. Green, Chas. R. Ellicott, S. J. Kidder, F. M. Nellis, C. J. Olmstead, R. P. Noble, E. L. Andreon and C. P. Cass. Space 19, 21, 23, 25, 27, 29.

Westinghouse, Church, Kerr & Company, New York, N. Y.—Plans and photographs showing the design and construction of machine shops, erecting shops, boiler shops, locomotive and freight car blacksmith shops, stripping shops, planing mills, foundries, power plants, storehouses, roundhouses, etc., with which Westinghouse, Church, Kerr & Company have been connected as engineers or constructors. Represented by R. C. Barnard, E. R. Cate, H. S. Clark, W. G. Clark, T. N. Gilmore, S. E. Junkins, H. R. Kent, H. H. Kerr and C. M. Vail. Space 19 to 29.

Westinghouse Electric & Manufacturing Company, East Pittsburgh, Pa.—Reception Booth. Represented by Chas. Robbins, F. H. Herzsch A. G. Popcke, W. H. Patterson, H. C. Mode, R. E. S. Geare, R. F. Moon, W. H. Easton and F. W. Harrison. Space 19, 21, 23, 25, 27, 29.

Westinghouse Machine Company The, East Pittsburgh, Pa.—Reception Booth. Represented by E. H. Sniffin, L. L. Brinsmade, H. A. Rapelye and W. B. Brew. Space 19, 21, 23, 25, 27, 29.

Wheel Truing Brake Shoe Company, Detroit Mich.—Abrasive brake shoes. Represented by J. M. Griffin. Space 515.

Williams Company, Inc., G. H. Cleveland, Ohio.—Buckets for Steam Shovels. Represented by G. H. Williams. Space 177.

Wilmarth & Morman Company, Grand Rapids, Mich.—Surface grinders; wet tool grinders; lathe center grinders; New Yankee drill grinders; cutter and reamer grinders; loose pulleys. Represented by Chas E. Meech, B. C. Saunders and C. H. Slaughter. Space 160, 162.

Wilson Remover Company, New York, N. Y.—Varnish and paint removers; methods of removing paints from wood and metal by spraying and vacuum cleaning. Represented by J. MacNaull Wilson and J. Whitney Wilson. Spaces 202, 204, 206.

Wood, Guilford S., Chicago, Ill.—Wood's flexible nipple end air hose protector; the Monogram train pipe bracket; standard improved all steel warehouse truck. Represented by Guilford S Wood and D. F. Jennings. Space 604.

Yale & Towne Manufacturing Company, The, New York, N. Y.—Chain blocks; electric hoists; trolleys; special hoisting devices; padlocks; signal padlocks; indicator padlocks; dining car locks; Yale checks; Blount checks; station hardware; latches; deadlocks; mono locks. Represented by R. T. Hodgkins, W. A. Hall A. W. Patterson, Jr., D. A. Wright, F. A. Mavcumber, J. F. Stoldt and H. H. Ricketts. Space 129, 131.

Zug Iron & Steel Company, Pittsburgh, Pa.—Stavbolt and engine bolt iron; forging iron; chains for steam shovels. Represented by John H. McCloy. Space 209.

Railway Age Gazette

DAILY EDITION

Copyright, 1912, by the Simmons-Boardman Publishing Co.

Vol. 52. NEW YORK—JUNE 13, 1912—ATLANTIC CITY. No. 23b.

PUBLISHED EVERY FRIDAY AND DAILY EIGHT TIMES IN JUNE, BY SIMMONS-BOARDMAN PUBLISHING CO., 83 FULTON ST., NEW YORK.

CHICAGO: 417 South Dearborn St. CLEVELAND: Citizens Bldg.
LONDON: Queen Anne's Chambers, Westminster.

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Subscriptions, including 52 regular weekly issues and special daily editions published from time to time in New York, or in places other than New York, payable in advance and postage free:

United States and Mexico	$5.00
Canada	6.00
Foreign Countries (excepting daily editions)	8.00
Single Copies	15 cents each

Engineering and Maintenance of Way Edition and the four Maintenance of Way Convention Daily issues, North America, $1.00; foreign, $2.00.

Entered at the Post Office at New York, N. Y., as mail matter of the second class.

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ONE matter was touched upon by President Stewart yesterday morning that will have to receive attention, and the strange part of it is that the necessity for that attention has not been so forced to the front by the experience of the railways during the past year, as to call out action by the executive committee in advance of the convention. It is the influence of the safety appliance act on interchange. As the law stands there is a penalty attached to the running of cars stencilled with "United States Safety Appliances," unless they are properly equipped. And, further, it is required that all cars passing through the shops for general repairs, whether of home or foreign roads, must be equipped with safety appliances. As President Stewart said, it is quite impossible to inspect all cars for standard safety appliances at interchange points, and therefore, a heavy provision should be incorporated in the rules of interchange for collecting any pieces, that may be imposed on the operating road, from the owner. Again, there should be a regular set of charges formulated for the application of the safety appliances. Both of these points should be comparatively easy of adjustment, and should and probably will receive the prompt attention that they deserve.

THE constitution of the Master Car Builders' Association which was adopted in June, 1909, has been found generally satisfactory, and the only important change suggested by the Committee on Revision relates to the ballot for officers. The nomination of three persons as candidates for president and six persons as candidates for vice-presidents was found to be cumbersome, and took too much time. The change recommended by the committee was regarded as almost too radical, and objection was made to a printed ballot which contained only one name each for president and vice-presidents. Mr. Vaughn's amendment, which was adopted, provides that the ballot may be something like that used by the American Society of Mechanical Engineers where a group of, say, 20 members may nominate a special ticket which shall be printed on the regular ballot. This overcome the objection to the writing of independent names on the regular ballot, as a scattering vote of this kind usually has no force. It was pointed out incidentally in the discussion that on the regular ticket for new members of the executive committee of the Master Car Builders' Association, nominated by the nominating committee, not one master car builder is included, all being motive power officers who had their practical training in locomotive shops. This is certainly a good argument for presenting an opportunity for an independent vote for the officers of the Master Car Builders' Association.

THE report on brake shoes was a report of "progress" without there being any progress to report. It contains certain recommendations for future investigation that the executive committee of the M. C. B. Association did not see fit to make an appropriation for during the past year. These consisted of tests at high pressures (12,000 to 18,000 lbs.), at speeds somewhat below the maximum at which work has been done. It is undoubtedly important that this work should be done; valuable information would be obtained by it. If the best braking work is to be done, it is necessary to be fully acquainted with the sliding scale of the coefficient of friction and know all of its vagaries in its relation to pressures and speeds which were first suggested by the Galton-Westinghouse experiments of a generation ago. We know far more than Col. Galton did, but when all is said and done there is one little point of frictional resistance that places the limit on the efficiency and the rate of retardation producable by any brake shoe in actual service. This is the area of contact between the wheel and the rail, and no brake shoe resistance should exceed the resistance at this point. It is in this that the work on the testing machine differs from that on the road. Excessive pressures of 18,000 or 20,000 lbs. may be used to advantage on the machine; the rate of retardation may be very rapid and the length of stop as measured by the number of rotations of the wheel may be very short, with a correspondingly brief interval of time. But this is far from proving that the same length of stop can be duplicated with a car or train upon the track. The coefficient of friction may be high for the high pressure and speed—too high, in fact, to be useable. And, so, while it is desirable that we should know what may be accomplished in the laboratory with these excessive pressures, it does not

seem probable, from what has already been done, that they will be available for work on the road.

WHILE there is general dissatisfaction and complaint as to the poor quality and short life of air-brake hose, there has been "little doing" by the Master Car Builders' Association in the making of a thorough investigation of modern methods of manufacturing rubber so that a proper specification can be prepared. The present specification has not been revised, except the label, since 1905, and it could be improved in several respects, not only as to the quality of rubber required, but as to the tests and inspection. A revision of this specification was suggested in the President's address, and it is so recommended in the report of the committee on Train Brake and Signal Equipment. The present specification puts a premium on softness, and it does not state the proper relation between the strength and stretch of the material which is necessary to secure the desired quality of rubber. The soft compound, even if made of fine Para rubber and sulphur, is not the best for air-brake hose, and a stronger material with a firmer texture is required. Rubber having the desired quality should possess a higher tensile strength and higher elongation than is required by the present specification. The manufacture and testing of rubber has developed considerably since 1905. The maximum tensile strength now required is 400 lbs. per square inch, and this should be increased to 800 or 1,000 lbs. for the inner tube, with a stretch to properly balance such strength. The strength and stretch test for the cover need not be quite as severe as that for the inner tube. As there is some variation in the thickness of rubber in different parts of the circumference, the average of at least 12 measurements by micrometer should be used in obtaining the area for stretch and tensile strength. In the stretch test the tube sample should be under a stress of 400 lbs. for ten minutes and the cover should be placed under a stress of at least 300 lbs. Samples should be tested at a uniform temperature of 70 deg. F., and the testing machine should work at a uniform speed of 20 in. per minute. A minimum strength of 800 lbs. per square inch, with an ultimate elongation at the breaking point of 9 in., could be easily obtained at a price no higher than that now paid for the soft and weak rubber which present specifications admit and which has shown a decided tendency to deteriorate very rapidly.

IF freight cars are to be kept in a proper condition to transport material without danger of damaging it, and at the same time are to be maintained at a minimum cost, it is not only necessary that they should be properly designed and built, but that repairs should be made promptly and systematically. While it is practically impossible to keep track of the exact condition of each individual car, it is possible to keep the average condition of the equipment at a high point by placing certain regulations in force and seeing that they are lived up to. For instance, one road which is notable because of the low cost of maintenance of freight cars does not have any special trouble with a type of car roof, which is giving one of its neighbors a great deal of trouble, simply because each car repair point on the system is ordered to renail a certain number of these roofs every month. Even if similar regulations concerning other parts of the car were not in force, the moral influence of this one, if properly enforced, would necessarily have a considerable effect on the proper upkeep of the rest of the cars. A small and comparatively unimportant defect soon grows to serious proportions if not promptly attended to, but the car repair forces over the system will not realize the importance of this unless the management takes active steps to show that it is not only in sympathy with the right way of doing things, but that it intends to insist upon its being followed.

CAR WHEELS.

THERE are many points in the excellent report on Car Wheels that should receive the careful consideration, not only of the members of the Master Car Builders' Association and railway men generally, but of all those who are interested in the development of the steel wheel and the improvement of the cast iron one. Very early in the report, for example, there is the reason for refraining to offer a standard specification for solid steel wheels, because "the art of manufacturing solid steel wheels is yet in a process of development." In marked contrast to this conservative position, is the action of the Society for Testing Materials, which is shown in the two appendices, where the process of manufacture, as well as the product, is hedged in as though everything pertaining thereto had been so thoroughly completed that nothing more remained to be done in the way of experimentation, and the last word had been said, it being merely necessary now to protect the buyer from the unscrupulous manufacturer. This position of conservatism is, however, quite characteristic of the Master Car Builders' Association. It is holding off more and more from chemical analyses, and matters that may control methods of manufacture and simply asks for results, leaving manufacturers to attain those results, which are mechanical, in any way that may seem best. Surely, this is a sane and sensible method of proceeding.

Again, the committee touches gingerly on a point that has been under consideration for a number of years, but regarding which nothing has, as yet, been done. It is recognized that all metals, and especially all wheels, whether they be of cast iron or of solid steel, are subjected to internal stresses inherent in the method of manufacture, but of whose character or magnitude we know nothing. The matter was upon the point of being subjected to a critical investigation and analysis a number of years ago, but was stopped by commercial changes, and so has not been touched. It is practically certain, however, that something will be done during the coming year in the way of determining what these internal stresses are both in magnitude and direction, and it was this that the committee probably had in mind when it framed the paragraph to which allusion is made. Whether the committee will carry on any investigation itself is not hinted, but it is to be hoped that it will. That any method of inspection can be developed that will detect and measure these stresses without the destruction of the wheel is doubtful, but if it could be done, it would be of incalculable benefit to every user and maker of car wheels in the country.

A broader and more far-reaching problem is that of increasing the strength of the cast iron wheel flange by increasing its thickness, and here the committee acknowledges its helplessness. To add metal here involves frog and crossing clearances, over which the association has no jurisdiction and which can only be done with the co-operation of American Railway Engineering Association and the approval of the American Railway Association. It may involve such large expenditures for changes as to be impracticable, and the best to be expected in this direction for some time to come will be repeated reports of progress, when, in many cases, no progress has been made.

Another point on which nothing has been done, is in the design and specification of a wheel for a car of 140,000 lbs. capacity. In view of the criticisms that have been made of the cast iron wheel for cars of 100,000 lbs. capacity, it rather takes one's breath away to think of adding 40 per cent. to the nominal capacity and probably 30 per cent. to the actual wheel loads that have already caused so much anxiety.

Whether that anxiety is needless or not, need not be discussed here. Evidently the manufacturers will not fail to try to furnish a wheel suitable for high capacity cars, and it will be interesting to know what manner of wheel this will be that will carry a wheel-on-rail pressure of 25,000 lbs. or more.

The recommendations for the specifications governing solid steel wheels, are concise, to the point, and bear on the physical operating conditions of the wheel, without, in any way, dictating methods to the manufacturer.

The report is really a thorough and comprehensive statement of the last word to date on the car wheel question, and in its very conciseness and conservative attitude on the subject shows how fully the committee realizes the magnitude of the problem with which it has to deal and how conscientiously and painstakingly it has handled it.

COUPLER SIDE CLEARANCE.

THREE years ago tests were made and reported to the association by the coupler committee, which indicated that, so far as the train resistance or effect on the car structure was concerned, there was no advantage of a coupler side clearance greater than 2½ in. at the drawbar carrier iron on all steel cars over 40 ft. in length. The recommendation of the committee that the standard of the association be changed to read "The total side clearance of the coupler to be 2½ in." was carried on letter ballot by 1501 to 245 votes, and this now stands as the standard. This standard previous to 1909 read "Not less than 2½ in." The committee wished this to be changed because of the liability of the couplers not mating if quarter side clearance was allowed.

In spite of these tests and the vote on the letter ballot there are now many cars being built with coupler side clearance of 4 in. This spacing is standard on at least one of the largest systems, which has probably as few sharp curves as any road in the eastern section of the country. Cars with this clearance have been in use in large numbers all over the country for several years, and no trouble appears to have been caused with the couplers not mating, although no special centering device is used. It seems that the draft gear holds the coupler head sufficiently near the center to overcome any serious trouble with coupling.

When this subject was being discussed on the floor of the convention in 1907-8 the feature of flange wear was the principal point advanced in favor of increased side clearance. The tests, however, showed that there was but little difference in the train resistance with the various clearances from 1 in. to 5 in. This would indicate but small difference in flange friction. The features of loose and broken yoke rivets, broken knuckles and knuckle pivot pins and broken guard arms were not considered in the test, although the side pressures obtained were not excessive and seemed to indicate little danger in this respect. They did show, as would be expected, that the larger clearances gave the smaller pressures. There is little doubt but what the trouble with loose and broken parts of couplers are, to some extent, caused by strains due to a lever action around the carrier iron. Even though this may not seem to be excessive, if it can be reduced without introducing other difficulties it would seem advisable to do so. What it can be is proved by the many cars now running with 4 in. clearance.

The only real difficulty to be expected would be with the couplers getting off center. While with some arrangements of yokes and draft gear this might occur, devices are available which will insure the coupler head remaining practically at the center when free.

In view of these conditions it would seem more sensible to return to the old wording of the standards, viz.: "The total side clearance of the coupler to be not less than 2½ in."

Announcements.

TO-DAY'S PROGRAM.

M. C. B. ASSOCIATION.

Discussion of reports on:

Safety Appliances	9.30 to 10.00
Rules of Interchange Prices for Labor and Materials	10.00 to 10.30
Rules for Loading Material	10.30 to 10.45
Damage to Freight Equipment by Unloading Machines	10.45 to 11.00
Overhead Inspection	11.00 to 11.15
Coupler and Draft Equipment	11.15 to 12.15
Car Trucks	12.15 to 12.30
Springs for Car Trucks	12.30 to 1.00
Consolidation	1.00 to 1.10
Train Lighting and Equipment	1.10 to 1.30

ENTERTAINMENTS.

Orchestra Concert, 10.30 A. M.—Entrance Hall, Million Dollar Pier.

Orchestra Concert, 3.30 P. M.—Entrance Hall, Million Dollar Pier.

Informal Dance, 9.30 P. M.—Entrance Hall, Million Dollar Pier.

SUPPLY ASSOCIATION ELECTION.

The Executive Committee of the Railway Supply Manufacturers' Association has named the hours between 10 A. M. and 12 M., Friday, June 14, 1912, for the election of four members of the executive committee for terms of three years to fill the places of members whose terms expire on September 1, 1912.

This election will be held in the office of the executive committee, up-town side of the Million Dollar Pier, next to the enrollment booth. Ballot boxes will be open between the above named hours to receive votes for members of the Executive Committee from the following districts:

First district, New England States and Canada.—One member in place of Albert C. Ashton, Ashton Valve Company, Boston, Mass.

Second district, New York and New Jersey.—One member in place of Charles P. Storrs, Storrs Mica Co., Owego, N. Y.

Fourth district, Ohio, Indiana and Michigan.—One member in place of H. I. Lord, Detroit Lubricator Co., Detroit, Mich.

Seventh District, States west of the Mississippi River, including Louisiana, but excepting Iowa and Minnesota,—One member in place of E. L. Adreon, American Brake Co., St. Louis, Mo.

Election will be by ballot. A separate ballot box will be provided for each of the above districts. Official blank ballots will be provided. Ballots may be cast at any time between 10 A. M. and 12 M.

One vote only may be cast by each member, corporation, co-partnership or individual belonging to the association, same to be cast only by the properly accredited delegate of such member.

Each voting delegate shall deposit his ballot in the ballot box marked for the district within which the home office of his company is located. Every voting delegate should see that the person for whom he votes for executive member is a resident of the district in which the vote is cast, and is a representative of a member of the association.

ENTERTAINMENT COMMITTEE MEETINGS.

The entertainment committee meets at 10.00 o'clock each morning on the balcony over the enrollment booth. Every member of the committee is busy, but these meetings are an important factor in the work of the committee, and it is urged that members report for them promptly. They last only a half-hour or so.

M. C. B. DANCE TO-NIGHT.

The informal dance at the pier to-night will begin at 9.30.

The executive committee of the M. C. B. Association has selected the following dance committee to act with the sub-committee of the entertainment committee of the Railway Supply Manufacturers' Association: C. D. Young (Penna. R. R.), R. L. Kleine (Penna. R. R.), T. H. Goodnow (Armour Car Lines), E. J. Searles (B. & O.), H. L. Trimyer (S. A. L.), Alexander Kearney (N. & W.). These committeemen will please report to Chairman Mitchell of the entertainment committee. The members of the latter committee who act as a sub-committee for the dance to-night are Messrs. Younglove (chairman), Hayes, Hibbard, Dunkelberg, Wardell, Sherman, Nellis, Illingworth and Krepps.

ATTENTION, BALL PLAYERS!

All candidates for the western team please meet at the Enrollment Committee's booth at 10.30 o'clock this (Thursday) morning.

Proceedings.

The first session of the forty-sixth annual meeting of the Master Car Builders' Association was held in the Greek Temple, on Young's Million Dollar Pier, Atlantic City, N. J., on Wednesday, June 12, 1912.

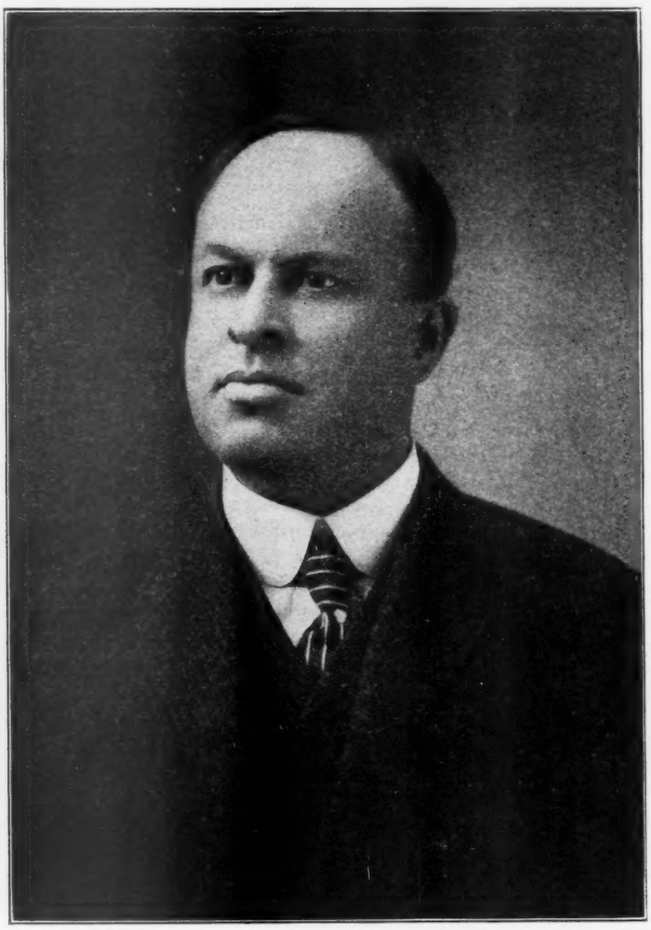
The president, A. Stewart (So. Ry.), called the meeting to order at 9.40 o'clock. The Rev. Dr. Newton W. Caldwell invoked the Divine blessing. Mayor Bacharach, of Atlantic City, welcomed the Association to the city J. J. Hennessey (C. M. & St. P.), replied to the address of Mayor Bacharach.

ADDRESS OF PRESIDENT STEWART.

We are assembled this morning to conduct the business assigned for consideration at this, our forty-sixth annual convention of the Masters Car Builders' Association, and it gives me great pleasure to welcome you.

The meetings of the Association, which have now been held for forty-six consecutive years, have contributed more than the work of any other organization toward making it possible for the vast railway interests in this country to carry on their interchange of business. We are meeting again this year, with the approval of our respective companies, to further perfect our rules, and, if possible, to revise them in a manner that will still further reduce our cost of maintenance and clarify matters that have not been understood alike by all of our members; also to devise the best possible manner of complying with new legislation affecting the construction, maintenance and handling of equipment in interchange.

Much earnest work has been done by the committees on the various subjects up for consideration by this convention, but on account of the range of subjects listed for consideration, upon which reports are to be presented and discussed, it is deemed neither practicable nor desirable in this address to discuss in detail or to analyze the general work of the committees as represented by their reports.



A. STEWART,
President, M. C. B. Association.

On account of the personnel of the various committees and the earnest efforts that have been expended in the preparation of their reports, the amount of work that has been accomplished is not only creditable, but the Association is to be congratulated upon the excellence and quality of the work as reflected by these reports.

A very important matter that has not been assigned to any committee, and of such vital importance that action should be taken, relates to the interchange of equipment as effected by the recent Safety Appliance Acts. We have nearly a year's experience working under the new order of things and questions have been raised that can only be answered with the approval of this Association and I urge the necessity for action. We are required to change the safety appliances to standard on both system and foreign cars going through the shops for general repairs, and we should have a rule for charging the car owner with a portion of this expense. It is my understanding that we are now subject to a penalty for handling cars marked "U. S. Safety Appliances," if the cars so marked are not in accordance with the law. To inspect all cars received with safety appliance defects, including location, is obviously out of the question and we should have a rule that will relieve the receiving line for penalty defects and material, location or manner of application, when cars have been stencilled as complying with the law.

Cars that have been fitted with the special 12 in. coupler to give the required end clearance should be so stencilled for protection to the owners and for the information of the inspectors.

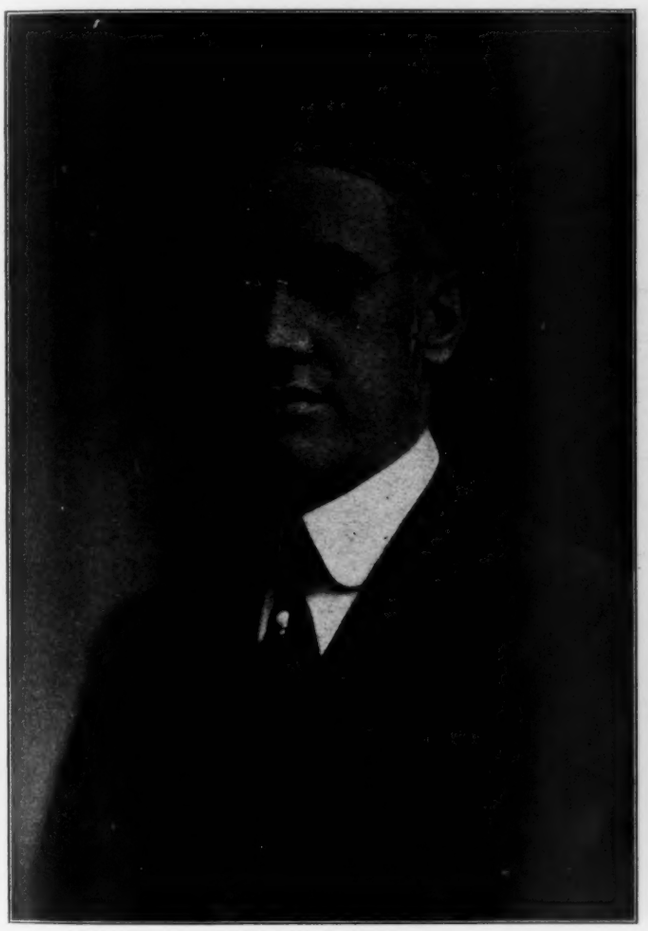
We should consider a rule for a fair basis of interchange where it affects the removal or turning of steel wheels under freight equipment, and a proper charge for wooden cars which have been reinforced by continuous metal draft sills.

The question of changing the present M. C. B. specifications for air brake hose has been brought to my attention, and a committee should be appointed to take up this matter and report what changes are necessary.

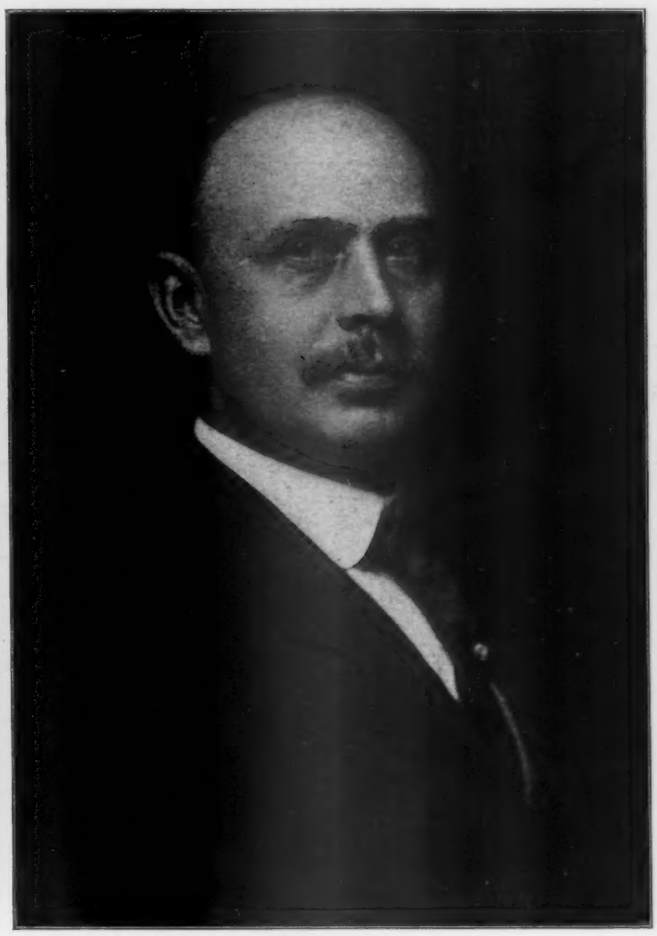
All of the members are earnestly requested to bring up the matters affecting interchange in which they are interested, in the hope that we may be able to promulgate rules so clear that they will be understood and accepted by all without the necessity of such frequent recourse to the Arbitration Committee.

It should be our earnest endeavor to promote to the fullest extent the harmonious relations that have hitherto existed between the Interstate Commerce Commission and its representatives and this Association, and in this connection I want to call your attention to the fact that the last convention took notice of the work of the Conference Committee, composed of members of this Association, that had to do with adjustment of the relation of the railways to the government with regard to safety appliances. That committee has been continued as a sub-committee of the Special Committee on the Relations of Railway Operation to Legislation, and during the last year represented the railways in a conference with the post office department on the standardization of postal car construction and equipment. This work has not been entirely completed, although specifications have been agreed upon, approved and issued by the post office department, covering construction of steel and steel underframe full postal cars and the equipment for all classes of mail cars. The work of this committee has illustrated the value of co-operation as between the railways and the different branches of the federal government in formation of regulating legislation, and I want to say that a great credit is due to the committee and especially to the chairman of that committee for the very able manner in which the subject has been cared for.

The hours to be devoted to our daily sessions are so arranged that time may be conveniently devoted to the sights and delights of this great seaside resort, but we should not be unmindful of the fact that we are here principally to attend to business, and, therefore, I respectfully urge that each attendant, aside from his prompt and regular attendance on the daily session, should take full advantage of the special opportunity to inspect and study the latest improvements in equipment and appliances as exemplified in the exhibit of the Railway Supply Manufacturers' Association. Never have the supply compa-



D. F. CRAWFORD,
First Vice-President, M. C. B. Association.



C. E. FULLER,
Second Vice-President, M. C. B. Association.

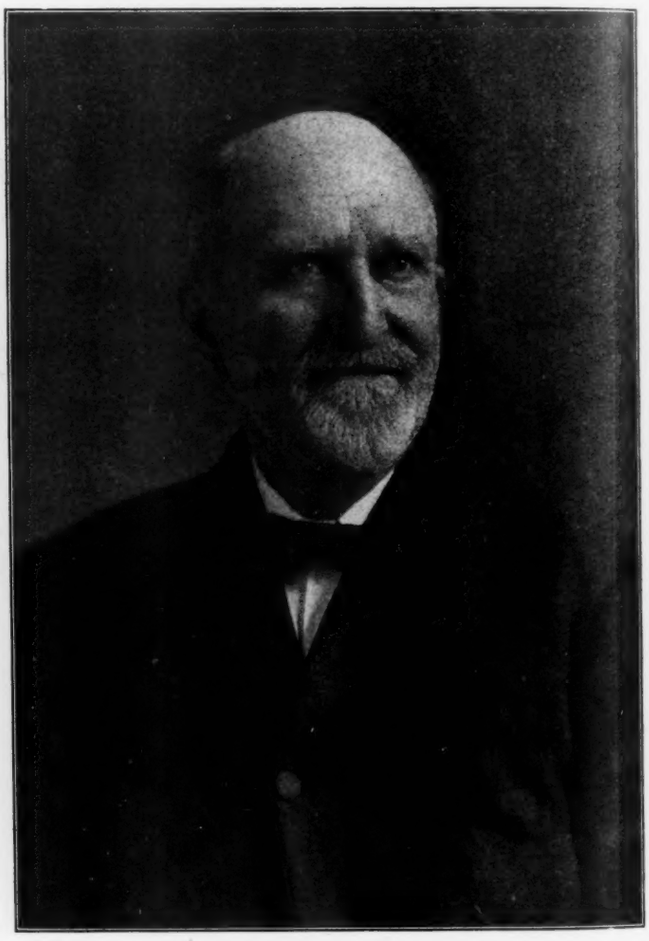
nies appeared before us with such an extensive exhibit, this year's exhibit even surpassing the high standard of excellence of former years.

At the close of the forty-six years' existence of our Association, it is gratifying to note not only the general progress that has been made by reason of the solution of the problems that have been presented, but also the general influence for good accomplished by the Association in the practical railway world.

To the members of the railroad press represented here I desire, in behalf of the Association, to express our appreciation of their enterprise and assistance in the past as well as at this meeting.

As the close of my service as President of this Association is near at hand, I desire to thank you for the honor you have conferred upon me in electing me to the position that I am so soon to relinquish, and I desire to further acknowledge my appreciation for the hearty coöperation I have received on all sides in my efforts to satisfactorily administer the affairs of the Association.

MORGAN K. BARNUM,
Third Vice-President, M. C. B. Association.



J. S. LENTZ,
Treasurer, M. C. B. Association.

ASSOCIATION BUSINESS.

Secretary Taylor then presented his report which showed that the active membership in June, 1911, was 422. Since that time there has been transeferred to representative membership, 7; dropped out of railway service, 7; resigned, 6; deaths, 3; transferred to life membership, 2; transferred from representative membership, 4; new members, 42; making a total of representative membership, 397; associate membership, 14; life members, 20, and a grand total membership of 874.

The secretary stated that during the year, 38 railways and private car lines had signified their desire to become subscribers to the rules of interchange, governing freight cars; and 7 railways had advised of their acceptance of the code of rules governing the interchange of passenger equipment. The report of the cars represented in the Association compared with last year is as follows: June, 1912, 2,959,397; June, 1911, 2,464,530, which is an increase of 494,867 cars.

The report of the treasurer showed that the receipts from dues of members was $12,307, and from sales of rules of interchange, proceedings, etc., $5,496.82, making a total of $17,803.82. The total expenses were $17,793.82. The amount of unpaid dues amounts to $988. The balance in treasury June 12, 1912, was $627.91.

The report of the secretary and treasurer was referred to an auditing committee, made up of E. W. Pratt (C. & N.), T. H. Goodnow (L. S. & M. S.), and F. F. Gaines (C. of G.). The dues for the current year were fixed at $4 as heretofore.

REVISION OF CONSTITUTION.

Previous to the adoption of the present Constitution, June, 1909, a nominating committee presented a verbal report to the convention at the first day's session, and the election called at the third day's session was by *viva voce*. It was felt by some of the members that this method did not offer the best opportunity for the membership to express their preference as to officers of the Association, and, therefore, when the Constitution was changed provision was made for the so-called secret ballot. It has developed in the election since the adoption of the Constitution that this method is not entirely satisfactory, requiring considerable time.

The committee has given consideration to the methods employed by the various technical associations for nominating and electing officers, and submit herewith the changes in the Constitution which it would suggest, as well as sample forms of ballots to be used.

In the proposed method each member has an opportunity to vote for the membership of the nominating committee and at the same time has opportunity to vote for any other member than those named by the nominating committee if he may desire to do so.

The committee would suggest, in order that this method, if approved, may be used at the Convention of 1913, that the subject be referred to letter ballot in January, 1913. It is

impossible, under the present Constitution, to change the method before the date mentioned.

The changes in the Constitution, submitted by the committee, are as follows:

Article 7, Committee on Nominations, section 1 to be changed to read as follows:

"SECTION 1. It shall be the duty of the Committee on Nominations to offer to the convention the name of one member as a candidate for each of the following offices: President, First Vice-President, Second Vice-President, Third Vice-President and Treasurer, and the names of three members as candidates for Executive members. Each person so named shall be either an active or representative member of the Association."

Article 9 to be added to by a second section as follows:

"SECTION 2. Printed ballots for use in the election of officers, Executive members, the Committee on Nominations. and for Associate and Life Membership, to be of the form appended hereto."

The ballot for president, for first vice-president, for second vice-president, for third vice-president, for treasurer and the one for executive members, contain just the number of names to be voted for, with one blank space. The following instructions accompany this ballot:

"To vote in favor of all the names on this ballot leave it as it is unmarked. To vote against a nominee draw a line through his name. If you wish to vote for another eligible person write his name under the one marked out. The names printed are those of the candidates proposed by the nominating committee."

The ballot for the Committee on Nominations is composed of ten names with instructions to vote for five. A blank space is also left for any additional name. The following instructions accompany this ballot:

"To vote against a nominee draw a line through his name. If you wish to vote for another eligible person write his name under the one marked out. The names printed are those of the candidates proposed by the executive committee."

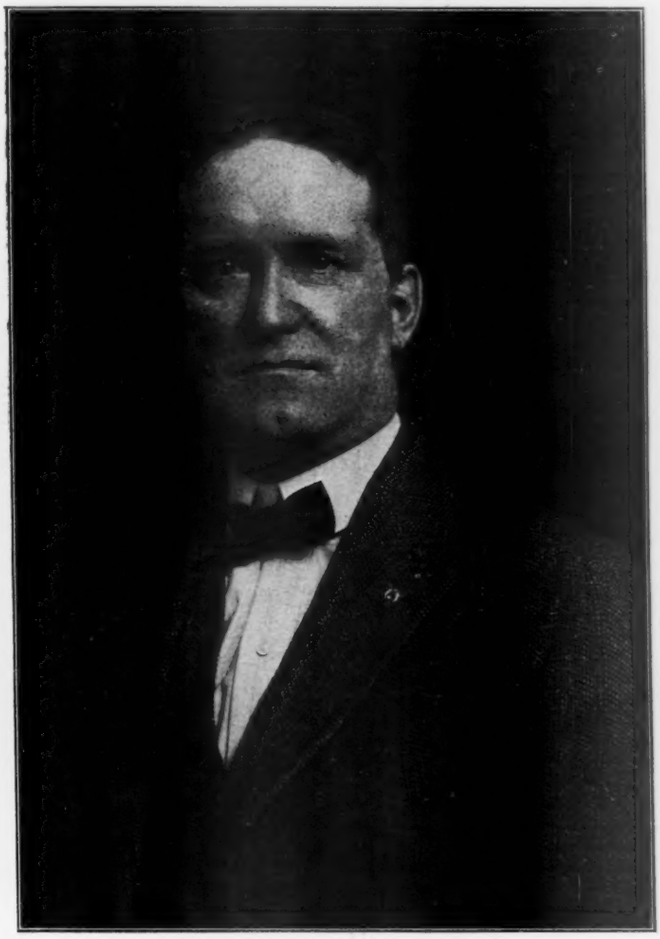
In the case of the ballot for life and associate membership, the instructions are to leave all names unmarked that are to be voted for and draw a line through the name of the one to be voted against.

The report is signed by D. F. Crawford (Penna.), chairman; C. A. Seley (C. R. I. & P.), and A. Kearney (N. & W.).

C. A. Seley (C. R. I. & P.), presented the report of the committee and added the following, which was suggested in the meeting of the executive committee last evening, and seemed to meet with approval. "Instead of having all members of the Association participate in voting on a letter ballot, that only representative members shall vote on matters submitted on letter ballot for adoption as standard, and on other subjects connected with the matter of standards.

The committee would, therefore, submit a further change of Section 1, Article II. The second sentence reads as follows: 'Such proposition shall then be submitted to the Association for discussion, after which a vote shall be taken to decide whether the proposition shall be submitted for decision by letter ballot to all members entitled to vote.'

"The proposed change is to make it read: 'Such proposition shall then be submitted to the Association for discussion, after which a vote shall be taken to decide whether the proposition shall be submitted for decision by letter ballot to all the representative members.'"



J. W. TAYLOR,
Secretary, M. C. B. Association.

DISCUSSION.

H. H. Vaughan (C. P.): I do not know that it is a matter of very great importance, as long as this association is entirely willing to trust the election of officers to its nomination committee, but I do think if we are going to have printed ballots, some method should be introduced for admitting the name of any other proposed officers to these printed ballots. Some section of the membership may wish to propose candidates other than those recommended by the committee on nominations. The effect of the proposed amendment as it now reads is to

make it a rather closed proposition, and I think that provision should be made for the addition on the printed ballot of the names of any other members that the executive committee, on the request of a certain number of members, see fit to have added to the ballot, so that candidates other than those proposed by the committee on nominations could be introduced and there would be a proper opportunity for having the names of such candidates considered in the election. Where a written ballot is in vogue, it is not so important, but where you put out a printed ballot, should not there be some method of having the names printed in as an alternative ticket, if an alternative ticket is desired to be put up by a certain number of the members?

F. F. Gaines (C. of Ga.): While I believe we all understand from Mr. Seley's remarks, concerning the recommendation of the committee on revision of constitution in regard to representative members voting, I want to make it clear that it is intended that the members shall have the privilege of voting according to the number of cars in the matter of standards.

Mr. Seley: I think it would be very difficult for the nominating committee to handle the matter exactly as Mr. Vaughan stated, unless there was considerable latitude. Here is a proposed form. Here is a name that is printed on the form, which is the name reported by the committee on nominations. Here is a blank under that name, and the instruction, "if you wish to vote for any eligible person, write his name under the one marked out." Now, if the committee on nominations should, under the advice of a certain number of members, present more than one name, it would be a departure from the method intended. Just how that would be handled I do not know. I am not sufficiently familiar with the subject, but it would seem, as far as the requirements of our election of officers are concerned that this simple method here ought to provide sufficient needs to meet all conditions. I think the politics of the case could be amply covered.

F. W. Brazier (N. Y. C. & H. R.): Last year I called the attention of the meeting to the large amount of red tape that was involved in the election of our officers. This is not a political organization, and I want to say, as one of the past presidents, I feel perfectly satisfied with the old way of electing the officers of this association when I look at the list of past presidents of the association, and, in my opinion, this matter of going into red tape in the election of our officers is uncalled for and unnecessary.

Now, with the greatest respect to the committee on nominations, I wish to point out one feature regarding the members who are proposed for election on the executive committee. There is not one car man on the committee. The car men are not all dead, and they are not going to die, and I think we should have some blank spaces so that if we want to put in a few of the car builders, we can do so, and have the car department represented on the executive committee of the Master Car Builders' Association.

Mr. Vaughan: What I desire is to have the practice along the same lines as that pursued by the American Society of Mechanical Engineers. They have an arrangement by which the nominees of the committee on nominations are printed as such, but if any section of the membership desires to put up any other candidates for office, they have the privilege of doing so, and the name of such candidates are entered on the regular ballot which contains the names of the candidates proposed by the committee on nominations. This nomination of a candidate other than those nominated by the committee on nominations has to be signed by a certain number of members. As a matter of fact, under this arrangement I do not think there is any particular danger, but if you had a nominating committee which desired to do so, they could arrange matters so that it would be very difficult to get any other name on the ticket than the names of the particular candidates reported by the committee on nominations. I do not think we are in any danger from that practice, but I do not think it is wise to adopt a plan for the nomination of officers that does not make it possible for the members to propose candidates other than those presented by the committee on nominations on the same ballot with those candidates.

As to writing in the names of additional nominees, what does that amount to? It means you will have to organize a movement among the members to put on the names you want to add, and to get everybody to write in the same names. There is no reason why alternate candidates desired by some section of the membership should not be presented to the association on the regular ballot for selection by the members.

C. A. Schroyer (C. & N. W.): Would not it cover your point, Mr. Vaughan, if in this proposed change to Article 7, it should read that the committee on nominations shall offer to the convention the names of one or more persons to each office?

Mr. Vaughan: No, sir, I think it would be very much better if they did not. I agree with the improvement which has been made in respect to our nominations for officers in eliminating the placing of the nomination of 2 or 3 names of each office, and I feel that it is a great improvement and much simplifies matters to have only one candidate presented for each office, as the regular ticket presented by the committee on nominations; but I do think there should be a provision, whereby if we are to use printed ballots, any desired additions might be made to the nominees presented by the committee on nominations, such additional names as may be endorsed by a certain number of the members of the association to be printed on the ballots along with the regular nominees, and I believe that provision should be made to cover that point.

Mr. Schroyer: That would be done through the committee on nominations.

Mr. Vaughan: The executive committee or whoever gets out the ballots. Perhaps that would fall within the duty of the secretary, but the idea is where a certain number of members, say 20 representative members ask to have an alternate name placed on the list of nominees, that the name of such alternate candidate shall be printed on the ballot as well as the others. I will make it as an amendment.

The Secretary: What is the number of men who should propose another set of officers, in order to have the additional set of officers printed on the ballot, to have their names entered on the ballot?

Mr. Vaughan: I should say where 20 members desire to propose a name of any member for any office in place of one or more of the names suggested by the nominating committee, that the secretary shall place that member's name on the printed ballot, making a statement in connection with such name that it has been proposed by a certain number of members. I make that as an amendment.

M. K. Barnum (I. C.): I second the amendment.

Mr. Seley: As a member of the committee of revision of the constitution, I will accept that as an amendment to Section 1, Article 7.

A. Kearney (N. & W.): As a member of the committee of revision of the constitution, that is acceptable to me.

The President: A majority of the committee accept the amendment. The question is now on the report of the committee as amended.

Mr. Seley: I also ask to have that motion include the revision of the committee to Sec. 1, Article 11, as regards letter ballot.

Mr. Schroyer: I make that as a motion, that that also be included. (The motion was carried.)

The report of the committee was then adopted.

REVISION OF STANDARDS AND RECOMMENDED PRACTICE.

After due consideration of present standards and recommended practice of the Association, together with replies from members to the circular of inquiry, and requests involving standards presented by the Secretary, the committee reports as follows:

STANDARDS.

Journal Boxes and Details.

Page 523, Sheets M. C. B. 7 and 9.

2. A member suggests that the wedge for the 5 in. by 9 in. journal box be changed in design to provide for increased end-bearing surface against stop lugs.

The committee approves this recommendation.

Journal Boxes for Passenger Cars.

Page 525, 5 in. by 9 in. Sheet M. C. B. 8-A; 4¼ in. by 8 in. Sheet M. C. B. 13.

3. The committee received the following communication from McCord & Company:

"On looking over the recent designs of passenger pedestal journal boxes I was very much impressed with the lack of consistency in the areas of the equalizer seats.

"A 3¾ in. by 7 in. journal has an area of 26¼ sq. in., the equalizer seat is 3⅝ in. by 6½ in., giving it an area of 23½ sq. in.

"The area of the 4¼ in. by 8 in. journal is 34 sq. in. The equalizer seat is 3½ in. by 6¼ in., giving 21⅞ sq. in. of bearing surface.

"The area of the 5½ in. by 10 in. journal is 56 sq. in., and the equalizer seat as designed at present is 3½ in. by 6 in., giving it also 21 sq. in. of equalizer bearing surface.

"The 3¾ in. by 7 in. box is not illustrated in the proceedings, so I do not know where these dimensions have been obtained, but the 4¼ in. by 8 in. and the 5 in. by 9 in. are M. C. B. Standard.

"The 5½ in. by 10 in. has not been passed upon by the Association, but the railways seem to be inclining toward 3½ in. by

6 in. for the equalizer seat. It seems to be only reasonable that the equalizer seat area should be in direct proportion to the journal area.

"In following up the service given by these boxes it is evident that the equalizer seat area on the 5 in. by 9 in. box is not sufficient. The boxes seem to wear out in the equalizer seat before they do in the pedestal channels, and the object should be to have them both wear out at the same time."

The committee refers this to the committee on car trucks.

Passenger Car Journal Box and Contained Parts.

Page 525, Sheet M. C. B. 8-A.

4. A member calls attention to the mouth of the 5 in. by 9 in. passenger journal box not conforming with that of the 5 in. by 9 in. freight box.

The committee instructs the Secretary to make the necessary correction.

5½ in. by 10 in. Journal Box and Details.

Page 524, Sheets M. C. B. 10 and 12.

5. A member suggests that the wedge for the 5½ in. by 10 in. be changed in design to provide for increased end bearing surface against stop lugs.

The committee approves this recommendation.

Dust Guards.

Page 533, M. C. B. Sheet 15.

8. The committee received the following communication from McCord & Company:

"I beg to call your attention to some inconsistencies in freight

T. H. GOODNOW,

Chairman, Committee on Revision of Standards and Recommended Practice.

and passenger journal-box designs, so far as the M. C. B. standard dust guards and the dust-guard slots and the holes in the dust-guard walls of the M. C. B. boxes are concerned." A drawing was enclosed showing the clearances of the dust-guard seat on the axle and the box and the dust guard on the box in various positions. The committee referred this to the committee on car trucks.

Distance Between the Backs of the Flanges of Car Wheels.

Page 535, Sheet M. C. B. 16.

10. A member suggests adding paragraph as follows:

"In 1909 the minimum distance permissible between the backs of flanges at base line of tread was fixed at 4 ft. 5 3-32 in." Omitting the words "Modified 1909" from the third paragraph.

The committee concurs in this recommendation.

Brake Head and Shoe.

Page 541, Sheet M. C. B. 17.

13. A member calls attention that the location of the lugs from the vertical dimension line are not correct when the head is developed from the radial center line as located, as indicated by sketch accompanying.

The committee concurs in this correction.

Air-Brakes—General Arrangement and Details.

Pages 545 and 546, Sheet M. C. B. 18.

14. A member suggests that inasmuch as the capacity of the brakes must equal 70 per cent. of the light weight of car, this does not state at what cylinder pressure the percentage is based on, calling attention to the latest recommendation of the air-brake companies that this is to be on a cylinder pressure of 50 lbs. per sq. in.

The committee does not concur in this recommendation.

Automatic Coupler.

Pages 622 to 625, Sheet M. C. B. 23.

17. A member renews a suggestion that was presented during the 1910 Convention, in which was recommended to the committee on standards and recommended practice, the addition of an 8½ in. coupler butt, for the reason that the 6½ in. coupler butt was designed to be used with the 6¼ in. by 8 in. draft springs, allowing ¼ in. clearance.

Again the 9⅛ in. butt was designed to accommodate certain friction draft gears, requiring that width within the yoke. This recommendation was submitted to letter ballot and rejected, the vote being 1,191 yes and 614 no, the necessary votes for adoption being 1,203, or within 12 votes of carrying the recommendation.

Inasmuch as there are thousands of cars equipped with the M. C. B. class *G* springs, the 6½ in. butt is not sufficient in depth, and not being good practice to use liners between the butt and yoke ends (the diameter of class *G* springs being 8 in.), and, furthermore, this spring can not be used with the 9⅛ in. butt as the clearance is too great, also the spring would not be central. Therefore, this member believes the matter should again be submitted to the M. C. B. committee with a view of urging the adoption of the 8½ in. butt as standard.

The committee does not approve of this recommendation, inasmuch as it was voted upon and lost by letter ballot in 1910, the main objection being that it increases the number of standards that must be carried in stock for repairs.

Automatic Coupler.

Page 627, Sheet M. C. B. 23.

18. A member suggests to amend the specifications for M. C. B. couplers so as to admit as an M. C. B. standard couplers having the underneath uncoupling arrangement, calling attention to paragraph 4 on page 627.

The committee refers this to the coupler committee.

Pages 622 to 624, Sheet M. C. B. 23.

19. A member suggests that reference be made in the text to the authority for the temporary coupler having 12¼ in. head.

The committee concurs and advises that this will be taken care of in the 1912 Proceedings, on authority of result of the special letter ballot.

Signal Lamp Socket.

Page 639, Sheet M. C. B. 26.

20. Through the secretary the following communication from the American Railway Association was received:

"With the introduction of steel cars for passenger train service, it is found that the method of mounting the brackets for carrying the markers of trains is becoming mechanically so uncertain and irregular as to seriously interfere with the proper display of markers as protective signals.

"There is apparently no system governing the mounting of these signals, some being placed upon the corners of the roof, some high up and others about midway of the corner posts of the cars; while the castings used for the sockets on the cars and the brackets of the lamps are frequently rough, and so crudely fitted that the lamps can not be accurately sighted.

"There is found to be a variation in the angle of the axis of the bracket with the center line of the car. The western roads use an angle of 45 deg., while the Pennsylvania Railroad and many others of the eastern lines use an angle of 14 deg. 10 min.

"The lamp manufacturers, in their endeavor to make lamps suitable for the different styles of brackets on the cars, notch out the lamp holder so that it may be set accurately to an angle of 45 deg. They then with the notches subdivide the arc into three sections of 15 deg. each, which arrangement does not fit the Pennsylvania angle of 14 deg. 10 min. by a variation of 50 min. With the increasing high power of marker lamps it becomes more important than ever to have them set accurately in position to effectively perform their primary function of rear protection, and the sighting of a marker attached to the rear of a train is just as important as the proper sighting of a block signal or a train-order signal.

"In the matter of the safe operation of trains at night the efficient use of the train markers is of such vital importance that it should receive most careful attention, and I would suggest that the committee on transportation take up this subject,

and arrange for standard specifications for the attachment of the markers to all classes of cars in both passenger and freight train service."

The committee recommends locating socket at a 45 deg. angle, located on the corner post, and approximately 9 ft. 6 in. from the rail to the bottom of the slot of socket.

Siding, Flooring, Roofing and Lining.

Page 639, Sheet M. C. B. 26.

23. A member calls attention to the fact that with the present standard for tongue and groove in siding, roofing, lining and flooring it is impossible to drive up and make a tight joint on the face side, and suggests that it be cut back 1-32 in. on the under shoulder tongue edge.

The committee concurs in this recommendation.

Splicing of Steel Center Sills.

Page 643, Sheet M. C. B. 28.

28. A member calls attention to the second paragraph and the following paragraph, which refer to Fig. *A* and *B* for method of splicing center sills, in that the cuts on Sheet M. C. B. 28, showing the splicing of steel center sills, give the length of the reinforced plates as 14½ in. The length of the protruding end, while not given, is presumed to be 8 in. The text specifies two joints to be reinforced by plates on both sides to be not less than twice the length of the protruding end; therefore, the reinforced plate, shown on this cut, should be at least 16 in. instead of 14½ in.

The committee concurs with the suggestion, but recommends changing the text, paragraph two, to show 7 inch projection, instead of 8 in., so as to conform to the figures in cuts *A* and *B*.

Pamphlets, Catalogues, Specifications, Etc.

Page 649

29. A member writes as follows:

"I recently had the matter of standard size for specification and letter-head paper to consider in connection with some Government boiler reports, and comparing these with the Master Car Builders' standards as adopted, I notice there are a great variety of sizes used.

"The M. C. B. size for specifications and letter-heads is 8¼ in. by 10¾ in. I find we ourselves use Form 82, size 8⅜ in. by 11 in. This is padded. The Government uses a demy letter-head, 8 in. by 10½ in. Printer's letter-head size is 8½ in. by 11 in. As the M. C. B. specification does not seem to agree with anything that I have to do with, I am writing for information and ask why it should differ from that used by the Government."

The committee recommends the adoption of the Government's standard, 8 in. by 10½ in.

RECOMMENDED PRACTICE.

Box Car Side Door and End Door Fixtures.

Page 726, Sheet M. C. B.—F.

33. A member calls attention to the door-hasp staple plate as shown in details 16 in. long, while on door as 5⅜ in., the 17-in. length being rejected by letter ballot in 1911.

The committee agrees that it was an error in showing this as 16 in., in view of its rejection, but at the same time renews its recommendation to the Association for the 16-in. style, with four bolts.

Box Car Doors.

Sheets M. C. B.—F and F—1.

34. A member suggests advancing Sheet M. C. B.—F, showing box car outside hung door, and Sheet M. C. B—F-1, showing box car flush side door, to standard.

The committee concurs in this recommendation.

Marking of Freight Cars.

Page 641, Sheet M. C. B.—G.

35. A member suggests that this sheet be changed to show three stars following the stenciling of weight of car. This to correctly indicate the final light weight of car.

The committee would recommend that paragraph B, of M. C. B. Rule 30, as follows:

"Wooden and steel underframe cars one year old should be reweighed and restenciled, the weight to be followed by one star; cars two years old should be again weighed and stenciled, the weight to be followed by two stars; cars three or more years old should be again weighed and stenciled, the weight to be followed by three stars, which will indicate final weight." be incorporated in the text as a Recommended Practice, and the star indication added to Sheet M. C. B.—G.

36. A member calls attention to the minimum height of 1 ft. 10½ in. from center line of coupler to bottom of number, being insufficient to properly locate lettering on steel underframe gondola cars, and suggests that this be made 1 ft. 5 in.

The committee concurs in this recommendation.

Cast-iron Wheels.

Page 538, Sheets M. C. B.—N, O and P.

38. A member calls attention that the seventh paragraph should be changed so as to include the modified form of wheel gage, Proceedings 1909 and 1911.

The committee agrees that the wording should be changed, omitting the date reference and to read as follows:

"The thickness of the flange shall be regulated by the maximum and minimum flange thickness gages adopted by the M. C. B. Association."

Lumber Specifications.

Pages 742 to 787.

40. A member calls attention to the lumber specifications, raising question as regards their intent with special reference to allowable defects, taking into consideration the length of piece. For instance, in purchasing siding lengths of from 5 ft. to 18 ft., with the specifications as they stand, would the same number of defects be allowed in a 5-ft. piece as in an 18-ft.?

This was referred to a member of the committee having in hand the lumber specifications, with advice to the effect that it was the intention of the committee that the allowable defects laid down in the specifications were for standard lengths of lumber, and the committee concurs in this opinion.

Classification of Cars.

Page 733.

41. A member suggests designations for certain kinds of refrigerator and ventilator cars, which have been described by the Railroad Refrigerator Service Association, as follows:

Symbol.	Kind of Car.	Description.
RS	Standard Refrigerator.	Equipped with insulation, ice tanks and ventilating devices.
RA	Meat and Provision Refrigerator.	Equipped with insulation and brine ice tanks without ventilating devices.
RB	Beer and Ice Refrigerator.	Body and doors equipped with insulation, having no ice tanks or ventilating devices.
VS	Standard Ventilator.	Equipped with insulation, including insulated side, end and top openings, and ventilating devices without ice tanks.
VA	Vegetable Ventilator.	Equipped with insulation, but having common box car end and side doors which afford no protection against heat or cold.

This is also suggested by the Association of Transportation and Car Accounting Officers.

The committee concurs in this recommendation.

NEW SUBJECTS.

43. In accordance with action of this Association, 1911 convention, with respect to the establishment of a maximum standard or limiting height for the running-board of a standard dimension box car—

The committee, after careful consideration of this, believes that this is governed by the height of the brake staff as referred to on page 564 of the 1911 Proceedings, which fixes this at 14 ft., and with this in mind and the clearances for the brake wheel as established by the United States Safety Appliance Standards, determines the maximum height of running-board for the various construction of roof, and, therefore, does not concur in the suggestion.

44. The arbitration committee suggested that a committee be appointed to show the location and design for repair and defect card boards on steel cars, and which was referred to this committee by the executive committee, and included in our circular of inquiry, M. C. B. 14, under date of December 11, 1911.

The committee received only two responses, and with the information at hand there was not sufficient data as to the various styles of steel cars to enable a report at this time, and the matter is, therefore, referred to the Association for further instructions.

The report is signed by:—T. H. Goodnow (Armour Lines), chairman; C. E. Fuller (U. P.); W. H. V. Rosing (St. L. & S. F.); W. E. Dunham (C. & N. W.); S. M. Hindman (Penna.); O. C. Cromwell (B. & O.) and T. M. Ramsdell (C. & O.).

DISCUSSION.

F. F. Gaines (C. of Ga.): Mr. President, with all due respect ot the committee on standards, referring to paragraph 17, I think there is an excellent argument for re-submission, owing to the reason that the committee assigns for turning this down, the fact that we have already too many standards. As a matter of fact, the 8½ in. coupler butt has been used all over the country, and I would like to move the adoption of an

amendment that we resubmit this question again. I think it is high time that was made one of our standards. (The motion was seconded.)

Mr. Schroyer: Mr. President, I am opposed to that motion for the reason that it will require us to carry in stock a certain $1.50 bar to replace a $1.25 spring.

R. L. Kleine (Penna.): Mr. President, We are using the 8-in. spring and using them successfully. I hope the motion will not prevail for the reason that if we have the 8½-in. butt, it means the Pennsylvania would have to carry in stock in couplers four times what we have now. That not only applies to the 7-in. shank but also will apply to the 5-in. by 5-in. shank.

Mr. Schroyer: Mr. President, I am opposed to that motion for the reason that when we have standard butts of 6½ in. or 9¼ in., there is no reason why anybody should go to the 8½ in. butts, because they can follow either one or the other.

H. LaRue (C. R. I. & P.): In the committee's report they refer to the fact of having either to make a new yoke or make some repairs.

Mr. Kleine: I might say you could use an 8-in. butt with an 8-in. spring and hardly tell the difference.

J. J. Hennessey (C. M. & St. P.): I feel if you use an 8½-in. butt where a 9⅛-in. spring is used, it is necessary to change the yoke. You can't get your rivets in; if you spread, you put it out of line. While I am not strongly in favor of adopting another standard, I believe it is well to be considered in this convention. (The motion was put and lost.)

Mr. Hennessey: On page 2, they show a 5 in. by 9 in. journal box and details. I would like to ask the committee if they meant to put a gib on the top and take out the rocking part of the wedge?

Mr. Goodnow: Simply to increase it.

Mr. Hennessey: But you destroy the rocking motion?

Mr. Goodnow: No; it is 1/32 in. below. And that was not so much for the rocking motion as it was to allow, in removing the wedge, that much clearance in taking it out of the box.

Mr. Schroyer: I look at this in this way, that the rocking motion of the wedge is entirely destroyed by the use of that lug unless there is a recess in the top of the box. Suppose you do that, you increase the difficulty in removing the wedge, because the box must be jacked up that much higher. Another thing, the increased bearing of that wedge amounts to a very little, because the lateral motion of the car is absorbed at the end of the axle, so a strain on this is not unduly severe.

C. F. Thiele (P. C. C. & St. L.): I think with the 1/32 in. below the dip of the wedge, it will not be necessary to jack the box any higher.

Mr. Brazier: I want to congratulate the committee on their work—I think they have done very excellent work—and I move that the report be accepted. But I want to call attention to paragraph 35, "Marking of Freight Cars." That is what we all delay in doing. In the past ten years, 10,478 odd points have been stencilled. Furthermore, I want to congratulate the committee, referring to their recommendation in paragraph 41, "Classification of Cars," and referring to standard refrigerator cars. They have always claimed they did not have meat hooks or everything in it; and I think this is a good thing.

Mr. LaRue: I would like to call attention to paragraph 20, "Signal Lamp Socket." It has been the understanding, I believe, of the manager of the Rock Island for the past four or five years that the bracket should be over on the letterboard; and we have worked to that end. I dislike very much at this time, when markers are being used as signal expressions, that these should be put down on the corner posts as low as that. I think that the 45 deg. angle is correct.

Mr. Schroyer: I am glad to see the report of this committee, for it coincides with the Northwestern and shows we have done right; and the Pullman got it from the Northwestern, and the Pennsylvania got it from the Pullman. I think the report is all right and the Rock Island all wrong.

Mr. Kleine: I suggest this question be referred back to the committee for further investigation, and that investigation also adopt gages for both signs and lamp brackets.

D. E. Fitzgerald (M. P. & St. L.): The question of the location of these lamp brackets came up on the Frisco about two months ago, and is now under discussion, and the fact that the American Railway Association has brought it up suggests that it is of considerable importance. A great number of our engineers have suggested that there is a tendency at night to cloud the view of the lamp in that location; and there is the same tendency where you have it on observation cars; and I think before it is decided to locate it definitely on the corner posts, we ought to give the proposition of safety considerable consideration. For instance, on a wreck that occurred several months ago, it was said if the lamps had been located a little higher, the engineer could have seen them, but on account of dip in the track, he could not see the tail ends; and they were located on the corner posts.

Mr. Kleine: The recommendation they wish to make at this time is that the socket should be located on a 45 deg. angle. Now, that depends on the radius of the angle, as to how close that socket will come to the side of the car. The lens can be adjusted only by individual roads. On the open platform cars you may carry them up, on the vestibule cars down on the corners. In some roads you can only get a partial lens; other roads require a full lens. If you can give a dimension from the side of the car to the lens socket, then the lamp brackets can fit.

Mr. Goodnow: This recommendation came from the secretary of the American Railway Association to us to do this; so we took it from that, that they had not established one; otherwise it would not have been referred to us.

Mr. Seley: I think particularly the remarks of Mr. Fitzgerald emphasize the fact, and I would be in favor of further conferring with the Committee on Transportation of the American Railway Association advising them that the discussion of the matter in this convention had brought out the fact that there were two locations in general use, one approximately, 9 ft. 6 in. from the rail on the corner post, and also as stated by Mr. LaRue; and I would let them say whether two locations would be permissible, or which of the two would be advisable as to transportation.

It was moved and seconded that the report of the committee be received and the recommendations concurred in, with the exception of the lamp brackets and sockets.

Mr. Vaughan: On the question of New Subjects, section 43, which reads: "In accordance with action of this association, 1911 convention, with respect to the establishment of a maximum standard or limiting height for the running board of a standard dimension box car"—that is a subject in which we are very much interested, and I will put the clearances as stated by the committee, but we find that the height would only be limited to 13 ft. 10⅝ in. Now this subject to us, and I think to all roads, is an important one from the fact that we have in Canada legislation in connection with the height of clearances which is demanded, and I understand some of the bills have been introduced in the United States, and we feel that it is impracticable to discuss the construction of cars of more than standard height. That is a matter that rests as a rule outside of the car department. But one thing we can do and that is to fix the maximum height or standard dimension box cars. I think there is no objection to taking a limited height of 13 ft. 6 in. on the running board of standard box cars. As nearly as we can ascertain, there are only about 30,000 cars in the United States and Canada which exceed this limit. It seems to me just as reasonable for this association to fix a limited height for the running board of a car, as it has been in the past to fix the height of eaves, etc. But if we can establish a limited height that constructors would work to in their cars, there would be some hope of keeping this running board height down to a certain limit. The difference may not appear very great, but if it amounts in practice to nearly 6 in. in construction of bridges and in structures of that sort, it is important, and the amount of that kind of work that has been going on in Canada and the United States in recent years has been considerable. We are very much interested in seeing some action taken by this association that will put this matter in such shape that we can show the standard of the running board shall not exceed a figure to be determined by the committee on standards, which we hope they can make 13ft. 6 in. for a standard dimension box car.

Mr. Goodnow: In answer to Mr. Vaughan, I might say in considering this, one of the questions that came up in the committee's mind was the question of the longitudinal running board, coming up in connection with the outside metal roof, which naturally increased the height of the car at the eaves, and affected the height of the box car at that point. The committee felt that as we are limited now by the height of the brake wheel and the clearance of the brake wheel under the United States appliances standards, to go any further would be tying it down pretty tight. I should say you could not take the benefit of half an inch or an inch especially with outside metal roofs and the additional running-board that is required with that roof.

Mr. Vaughan: I should say there is no reason why the outside metal-roof designer should not be kept down to designing to the limit. It is the height of the running board that is involved in this question. If we are going to vote on the motion now, I would wish to make a motion that the report on the running board be referred back to the committee on standards.

The motion was seconded.

The report of the committee was then accepted.

TRAIN BRAKE AND SIGNAL EQUIPMENT.

The following subjects were referred to the committee for investigation and report:

STANDARDS FOR AIR BRAKES ON FREIGHT CARS.

This refers to item 12 of the 1911 report of the committee on standards. It was suggested that the double hand-brake arrangements shown on Sheet M. C. B. 18 do not conform to requirements of Interstate Commerce Commission and should be made

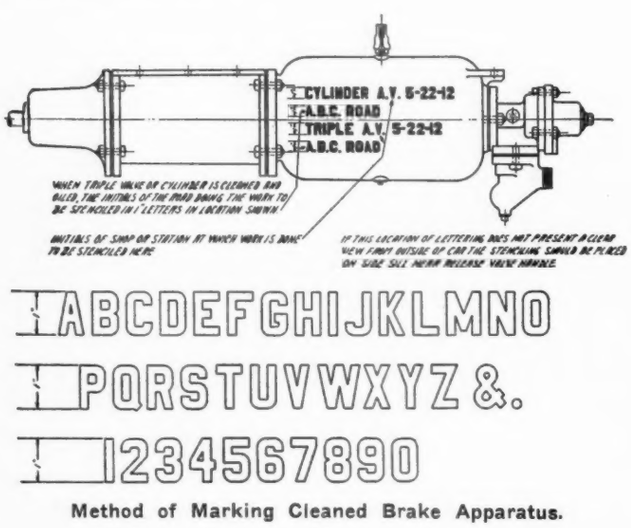
R. B. KENDIG,

Chairman, Committee on Train Brake and Signal Equipment.

to work with the air. The committee has revised Sheet 18 as suggested, showing the addition of a hand-brake lever connected to the cylinder lever with a chain in a manner that gives the same hand-brake power at each end of the car as that given by the single hand-brake arrangement. On account of the crowded condition of M. C. B. Sheet 18, the details had to be rearranged.

HIGH-SPEED FOUNDATION BRAKE GEAR.

This refers to item 48 of the 1911 report of the committee on standards. The committee has revised Sheets *J*, *K* and *L* to conform to the safety appliance standards. The revision contemplates a minimum of changes on old equipment. The cylinder is reversed, bringing the push rod at the opposite end from that previously shown; the cylinder lever is chain-connected to one end of the hand-brake lever. On new equipment the use of the floating lever fulcrum connection and chain may be discontinued and a fulcrum similar to that shown for the intermediate lever, Sheet *J*, can be substituted for these details on either of the 3 Sheets *J*, *K* or *L*. The hand-brake power is to be multiplied by means of a floating chain sheave on the hand-brake connection rod.


CYLINDER A.Y. 5-22-12
A.B.C. ROAD
TRIPLE A.Y. 5-22-12
A.B.C. ROAD
WHEN TRIPLE VALVE OR CYLINDER IS CLEANED AND OILED, THE INITIALS OF THE ROAD DOING THE WORK TO BE STENCILED IN LETTERS IN LOCATION SHOWN
INITIALS OF SHOP OR STATION AT WHICH WORK IS DONE TO BE STENCILED HERE
IF THIS LOCATION OF LETTERING DOES NOT PRESENT A CLEAR VIEW FROM OUTSIDE OF CAR THE STENCILING SHOULD BE PLACED ON SIDE SILL NEAR RELEASE VALVE HANDLE
ABCDEFGHIJKLMNO
PQRSTUVWXYZ &.
1234567890

Method of Marking Cleaned Brake Apparatus.

MARKING BRAKE APPARATUS.

The arbitration committee suggests that the stenciling should be illustrated in the rules, and directed that the committee submit a drawing showing how this should be done. The committee has prepared that shown in the accompanying illustration for this purpose. In order to condense the stenciling as much as possible, the words "cleaned and oiled," and "tested," have been omitted, as their significance is well known by all concerned.

CLEANING OF TRIPLE VALVES.

This subject was introduced at the convention by G. W. Wilden last year. Since that time Mr. Wilden has reported to the committee 66 specific cases between December, 1909, and June, 1911, where triples on N. Y. N. H. & H cars were cleaned and tested more frequently than that required by the rules, involving an average cost of 81 cents per cleaning. The committee, after investigating this subject, has no recommendations to make other than the proper stenciling and information required on the repair card as provided for in the rules of interchange.

M. C. B. HOSE LABEL.

The arbitration committee referred to this committee the advisability of adopting and having copyrighted a characteristic badge or label for M. C. B. hose, which should be of such form and in such location as to be readily observable by the inspector without going between the cars, and permission to use such label to be given the manufacturers only on their request. The committee finds that a copyright, such as suggested can not be obtained by the Association, which is a non-incorporated body, but has prepared a drawing showing that portion of the standard label marked "M. C. B.," extended so as to completely encircle the hose. This would make the label distinctive and readily observable without the necessity of going between the cars. If the proposed change in label were adopted by the Association, the committee would further recommend that Rule 58 in the rules of interchange be modified to read: "On and after September 1, 1914, delivering line responsible for hose not so labeled."

SIGNAL-HOSE COUPLING.

The executive committee referred to this committee the following communication from a member:

"There have been several cases where the efficiency of the air-brake system on passenger trains has been considerably reduced on account of the signal hose being coupled to the air-brake hose. When the signal-hose couplers are new it is very difficult to cause them to couple with the coupling on the air-brake hose, but when they become worn it is possible to make an imperfect coupling with ease."

The committee would recommend as a solution of this difficulty the adoption of a signal-hose coupling which would be exactly the same size and have exactly the same contour lines as the brake-hose coupling proposed to the convention last year and adopted by letter ballot, except that in its coupling feature the position of coupling lug and arm be reversed, making a left-hand coupling for the signal-hose. Such a coupling could not be imperfectly coupled with the brake-hose coupling. The gaskets or rings would be the same, and there would need be no experimenting with the coupling or contour lines.

AIR-BRAKE HOSE.

The committee has had called to its attention the desirability of improving the air-brake hose conditions. The specification for air-brake hose has been in use since 1905, and does not appear to produce a satisfactory hose. It would seem desirable to have this subject investigated by a special committee, giving attention to a revision of the specification requiring more severe stretching, pressure, unwinding and unwrapping tests, and also attention to the mounting of hose so as to produce a tight fit on the nipple.

The report is signed by:—R. B. Kendig (N. Y. C. Lines), chairman; R. K. Reading (Penna.); B. P. Flory (N. Y. O & W.), and E. W. Pratt (C. & N. W.).

The printed report of the committee, as presented to the meeting was revised by Mr. Pratt in the following particulars: The second item was amended to read as follows:

"Report of committee on standards, item 48 of 1911 proceedings, that sheets M. C. B., *J*, *K*, and *L* be referred to the committee on train brake and signal equipment for revision to conform to the safety-appliance standards, which provide that the hand brake shall operate in harmony with the power brake. The committee has revised sheets *J*, *K* and *L* as instructed. The revision contemplates a minimum of changes on old equipment. The cylinder is reversed, bringing the push rod at opposite end from that previously shown; cylinder lever is chain-connected to one end of the hand-brake lever. The

use of the floating lever fulcrum connection and chain may be discontinued, and cylinder and floating lever connection (B-C 2-A), and intermediate and truck lever connection (B-C 7-A) made in one piece, thereby eliminating five parts: B-C 5-A, B-C 4-A, B-L 2-A, B-C 3-A and B-L 3-A, as shown on sheet J."

The third item is corrected to read as follows:

The arbitration committee suggested that the stenciling should be illustrated in the rules, and directed that the committee submit drawing showing how this should be done. The committee has prepared for this purpose an illustration as shown. In order to condense the stenciling as much as possible, the words 'cleaned and oiled,' and 'tested,' have been omitted, as their significance is well known by all concerned.

"If the stencil reference to the cylinder and the stencil referring to the triple valve be made in separate pieces, this will be found convenient in avoiding the raised letters formerly cast on the auxiliary reservoirs."

In the item on M. C. B. hose label, the date at the end of the paragraph was corrected to the year 1915, the last sentence corrected reading as follows: "If the proposed change in label were adopted by the association, the committee would further recommend that Rule 58 be modified to read: 'On and after September 1, 1915, delivering line responsible for hose not so labelled.'"

At the end of the item on signal hose coupling, is added the following:

"(Samples of these couplings will be placed on the rostrum before the convention is over.)"

DISCUSSION.

I. S. Downing (L. S. & M. S.): In regard to the suggestions of the committee, they are all right, but we have experienced a great many times where an air line was defective, and we have coupled on to the signal line and thus kept the air on the train. If this was changed so it would be impossible to do this, we could not use the signal line unless we have a large pipe on the signal line and standard hose the same as the air hose. It has saved us a great many delays, especially in the middle of the night.

T. L. Burton: That question was brought to the attention of the committee when making the recommendations and was given careful consideration. The committee believe the objections raised could be easily met by carrying in the baggage car a reducing screw that could be put on to the end of the hose and inserted either into the signal pipe or the brake pipe, or, if necessary, a combination fitting that would couple up either brake or signal with a reducing screw; and, after the most careful consideration, the committee did not believe carrying this fitting in the baggage car was more objectionable than the failure arising through improperly coupled hose. There are two questions to be considered, one of safety, and one of carrying this special fitting.

It was moved and seconded that the report be accepted and referred to letter ballot.

Mr. Pratt: I hope the members will consider when voting on this matter, that which has been last under discussion. It is very handy to make a wrong coupling in order to save a moment or two on trains, specially made up, where a change in the order of the cars is a serious handicap; but it is a very much more serious matter when you are going into an "open draw," with a false coupling made unintentionally, and where, as Mr. Burton has suggested, there are other ways that will overcome this dangerous proposition, it is well to consider them.

The motion of acceptance was carried.

TESTS OF BRAKE SHOES.

As has been the case for the past two years, this committee has considered the subject of brake-beam standards as well as that of testing brake shoes.

Brake Shoes.

In its report of last year, the committee made the following recommendation:

"1. That some further work be undertaken by the Association for the purpose of connecting the results obtained under high brake-shoe pressures with those upon which the Association's specifications are based."

This recommendation was referred to the executive committee. Previous to 1911, the tests on brake shoes had been confined to pressures of 2,808, 4,152, 6,840 and 12,000 lbs., and to speeds of 20, 40 and 65 m. p. h. The tests made by the committee last year at a speed of 80 m. p. h. and at pressures of 12,000, 14,000, 16,000, 18,000 and 20,000 lbs. established new standards for high-pressure and high-speed service.

In order to complete the series and to furnish data for high-pressure specifications, it is desirable that some further tests of an intermediate character should be made on the shoes tested last year. The committee accordingly recommended for this year's program tests on these same shoes at a speed of 65 m. p. h. and at pressures of 12,000, 14,000, 16,000 and 18,000 lbs. The pressure of 20,000 lbs. is not included, since the results obtained last year show that no practical advantage attends the use of pressures higher than 18,000 lbs.

The committee further recommended that from the data thus obtained, specifications should be prepared covering the use of shoes in heavy passenger work. For various reasons, the executive committee of the Association did not find it expedient to appropriate money this year for these experiments and accordingly no work has been done.

In view of what has been said above, the committee feels that further tests should be made to complete the series and render available for the purposes of the Association the high-pressure work already done.

Weight of Fly-wheel on Brake-shoe Testing Machine.

During the discussion of the report of the brake shoe committee at the last convention, T. L. Burton (C. of N. J.), raised a question as to the desirability of varying the weight of the fly-wheel on the testing machine so as to correspond to the brake-shoe pressure and thus keeping the per cent. of braking power practically the same in the different tests. After some discussion, the question was referred to this committee for consideration.

The committee has considered the question and sees no

C. H. BENJAMIN,
Chairman, Committee on Brake Shoe Equipment.

good reason for making the change referred to. The fly-wheel of the machine was originally designed to store kinetic energy equivalent to that apportioned to one wheel of a 60,000-lb. capacity freight car. Fortunately, this corresponds very nearly to the energy per wheel of a modern 12-wheel passenger coach weighing 145,000 lbs.

In testing a brake shoe under these conditions, the method adopted is the same that would be used in testing a freight car or passenger coach of the above weights at different speeds and brake-shoe pressures. The only effect of increasing the mass of the fly-wheel would be to lengthen the time of stopping and to heat the shoe to a higher temperature. This has the effect on some shoes of increasing the mean coefficient of friction and on others of decreasing it. The committee does not feel that this would have any bearing on the question of the proper brake-shoe pressure to use under service conditions.

Recommendations.

In concluding this part of the report, the committee would make the following recommendations: That further tests be made on the shoes tested last year to connect the results with those previously obtained. These tests to be made at a speed of 65 m. p. h. and at pressures varying from 12,000 to 18,000 lbs.

Brake Beams.

Changes in Drawings.

The committee would recommend some minor changes in

the drawings of brake head and beam as shown on Sheet M. C. B. 17 and 17-A.

1. That the drawing of brake head on Sheet M. C. B. 17 be so changed as to show the hanger hole straight with a radius of ⅜-in. at each end, to accommodate the straight hanger with filleted corners.

2. That the drawing of brake-beam gage as shown in Sheet M. C. B. 17-A be so changed as to show an opening of 3½ in. instead of 3⅝ in. in order to make the drawing conform to the text of the specification as decided by letter ballot in 1907 (see Proceedings for 1907, p. 545).

Length of Brake Beam.

In view of the present uncertainty and misunderstanding as to the standard allowances for length of brake beam, the committee would recommend the adoption of the following interpretation:

That the specifications as to length of brake beams, adopted by letter ballot in 1907, shown on page 558 of the Proceedings, be interpreted as follows:

All brake beams shall be 60¼ in. in length from center to center of brake head, with a maximum allowable spacing of 60⅜ in. and a minimum of 60⅛ in.; this spacing to be measured by gaging inside of the brake head key lugs. On Sheet M. C. B. 17. the drawing of brake head shall be so changed as to show the hanger hole straight with ⅜ in. radius at the end.

Width of Slots in Brake Head.

The committee would recommend that the brake-head gage shown in Sheet M. C. B. No. 17 should be used for gaging the slots in the head with 1⁹⁄₁₆ in. as the minimum and 1¹¹⁄₁₆ in. as the maximum width.

Brake Beam Gage.

The committee would submit the drawing of a brake-beam gage shown in Sheet 17-A (Fig. 1), of this report for consideration and trial by members of the Association, with a view of adopting such gage as recommended practice to take the place of the present gage now shown on Sheet M. C. B. 17-A. The proposed gage determines the following dimensions and adjustments: Limiting outline of brake beam; length of beam; proper alignment of the heads in relation to each other; proper location of pin hole and center of strut, and angle of lever fulcrum.

Standard Brake Beam.

The committee would also submit the drawing of a No. 2 standard brake beam shown in Sheet 17-B (Fig. 2), of this report for consideration and trial by members of the Association, with a view of adopting such beam as Recommended Practice for No. 2 M. C. B. brake beams. The committee understands that this beam can be made without incurring liability for patent infringement for any valid and existing patent. This brake beam meets all the requirements of the Association so far as existing standards are concerned as to dimensions and also meets the physical tests required. The results of tests made at the testing laboratory of the Pennsylvania Railroad Company at Altoona, Pa., on such a beam are shown in Table 1.

DREXEL BEAM.			AJAX BEAM.		
Load.	Deflection.	Set.	Load.	Deflection.	Set.
500	.000	....	500	.000	....
6,000	.026	.000	6,000	.027	.000
6,500	.028	.000	6,500	.029	.000
7,500	.033	.000	7,500	.034	.000
12,000	.052	.000	12,000	.055	.000
15,000	.064	.002	15,000	.068	.000
500	.000	....	17,000	.079	.001
15,000	.062	.000	19,000	.085	.003
17,000	.068	.000	21,000	.097	.005
19,000	.075	.000	23,000	.104	.006
21,000	.083	.002	25,000	.113	.007
23,000	.094	.005	27,000	.126	.010
25,000	.103	.009	29,000	.136	.014
27,000	.116	.028	31,000	.155	.026
29,000	.147	.048	33,000	.190	.060
31,000	.182	.064	35,000	.389	.234
33,000	.236	.112	37,000	.520	.360
35,000	.450	.305	39,000	.900	.847
37,000	.335	.385	40,400	....	....
39,000	.934	.676	.....	....	....
41,200	....	....	.....	....	....
Bent through center.		Weight, 91 lbs.	Bent through center.		Weight, 95 lbs.

TABLE 1.—RESULT OF TEST OF DREXEL AND AJAX BEAMS PENN. R. R. LABORATORY, ALTOONA, PA.

It is the feeling of the committee that the time is ripe for consideration of a standard beam which shall meet the present requirements and specifications.

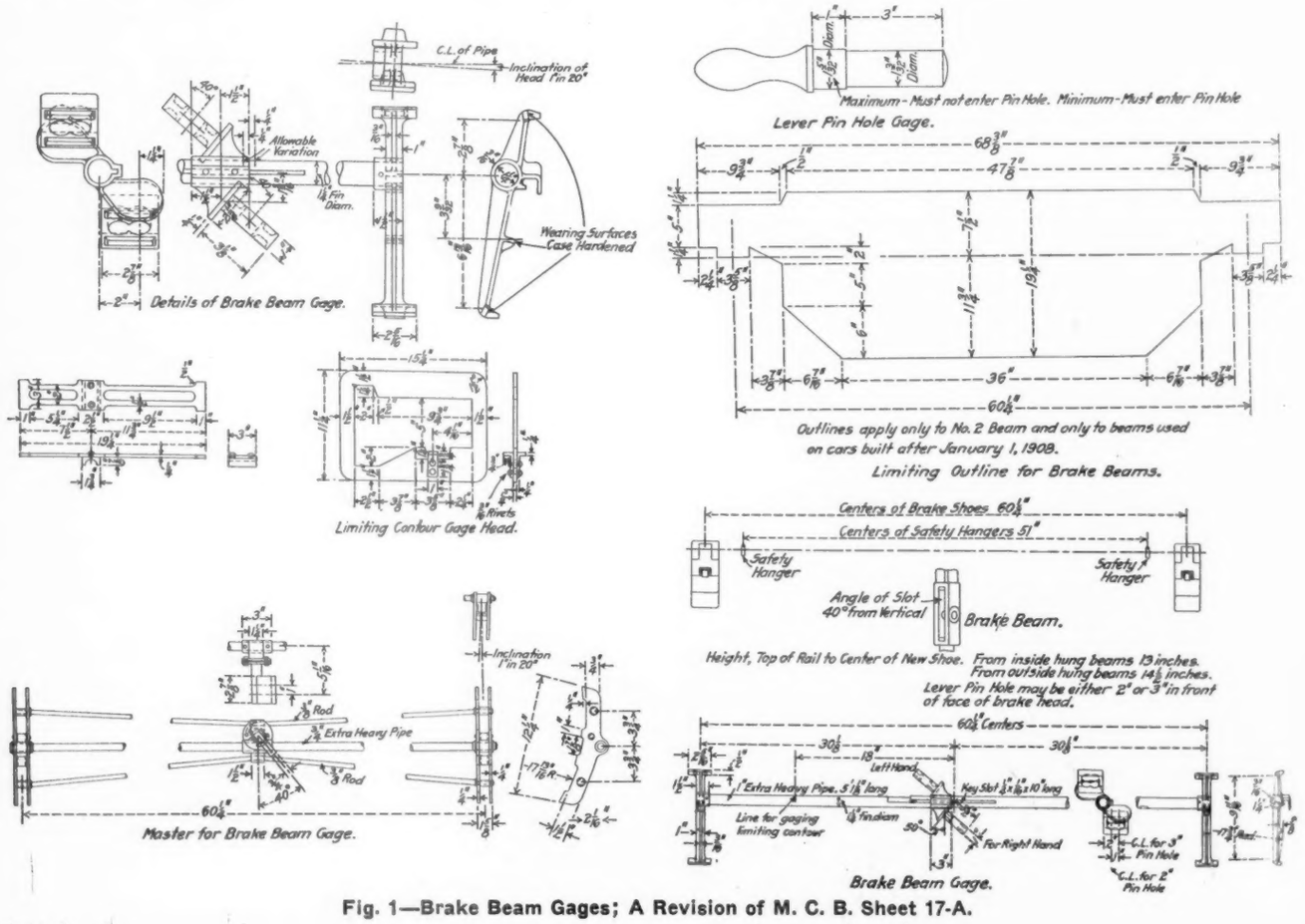

Details of Brake Beam Gage.
Limiting Contour Gage Head.
Master for Brake Beam Gage.
Maximum - Must not enter Pin Hole. Minimum - Must enter Pin Hole
Lever Pin Hole Gage.
Outlines apply only to No. 2 Beam and only to beams used on cars built after January 1, 1908.
Limiting Outline for Brake Beams.
Centers of Brake Shoes 60⅛"
Centers of Safety Hangers 51"
Safety Hanger
Angle of Slot 40° from Vertical
Brake Beam.
Height, Top of Rail to Center of New Shoe. From inside hung beams 13 inches. From outside hung beams 14½ inches.
Lever Pin Hole may be either 2" or 3" in front of face of brake head.
Brake Beam Gage.

Fig. 1—Brake Beam Gages; A Revision of M. C. B. Sheet 17-A.

Numbering Brake Beams.

It is recommended that in order to designate an M. C. B. brake beam, it be required that the letters "M. C. B." and the numerals "No. 1" or "No. 2," as the case may be, be cast, forged or stamped on the fulcrum. It is further recommended that after January 1, 1913, this be cast on the fulcrum, if the fulcrum be a casting, or forged on the fulcrum if the fulcrum be a forging.

New M. C. B. Association Sheets.

In accordance with what has been said before, the committee would submit new M. C. B. Association Sheet No. 17 to be substituted for the existing M. C. B. Sheet No. 17. The new sheet contains the standard brake head, shoe, key and gages for same in accordance with the last ballot of the Association. The gage for head also shows the maximum and minimum lines for gaging the top and bottom of slot opening, with 1 9/16 in. as the minimum and 1 11/16 in. as the maximum width. One dimension has been added to the brake head, which is the width of the slot corresponding to the width of the slot in shoe, or 1⅛ in.

The committee would submit M. C. B. Association Sheet No. 17-A, (Fig. 1), to be substituted for the present M. C. B. Sheet No. 17-A. This sheet contains the standard brake beam, brake-beam gage, pin-hole gage and standard limiting outline for brake beams. The diagram of angle of slot in strut, position of brake heads, together with the pin-hole gage, has been reproduced from the present M. C. B. Association Sheet No. 17-A. The limiting outline for brake beams has been modified in accordance with that shown on page 470, adopted in 1911 by the Association as the new limiting outline for brake beams, and there has been substituted a new brake-beam gage to take the place of the old gage shown on this sheet, in accordance with suggestions of the committee, for the approval of the Association. The committee would substitute a new sheet known as M. C. B. Association Sheet No. 17-B. (Fig. 2), which shows a proposed No. 2 standard brake beam with details, standard channel, strut and key-way gages for both the 2-in. and 3-in. pin-hole dimensions in front of brake head. This is the brake beam referred to in the preceding paragraph and is one which will meet all the requirements of the Association so far as existing standards are concerned, and will also meet the physical test required.

The report is signed by:—C. H. Benjamin, (Purdue Univ.), chairman; C. D. Young, (Penna.), and R. B. Kendig, (N. Y. C.).

DISCUSSION.

M. K. Barnum (I. C.): The road with which I am connected has made quite an investigation of the brake shoes that come to our scrap pile, and we have found a great many are worn on the flat of the face, and that a great many have the outside edge of the shoe overlapping the rim from half to an inch to an inch, and the only conclusion we can draw is that the brake beam is too long by about ½ in., and our observations indicate that this overlapping of the rim tends to shorten the efficiency, to shorten the life of the shoe, and tends to brake the wheel unequally. I would therefore prefer the paragraph with regard to the length of the brake beam to be changed, to make the standard length 59¾ in.; a maximum of 59⅞ in.; and a minimum of 59⅝ in.

F. F. Gaines (C. of Ga.): My experience entirely coincides with that of Mr. Barnum. I went into this thing some 8 or 10 years ago, and I found the shoes overhung on one side, and ruined the brake beam, and started the flange on the opposite beam, and I think the 59⅝ in. is very much better than 60¼ in.

C. D. Young (Penna.): I would like to say this subject was gone into at the time the 60¼ in. was established by the 1906 committee, and they presented diagrams showing the relative location of the shoe on the wheel, and I would think it would be a mistake to adopt this dimension offhand without giving the committee an opportunity to determine what other troubles may arise from a closer dimension than 60¼ in. I am inclined to

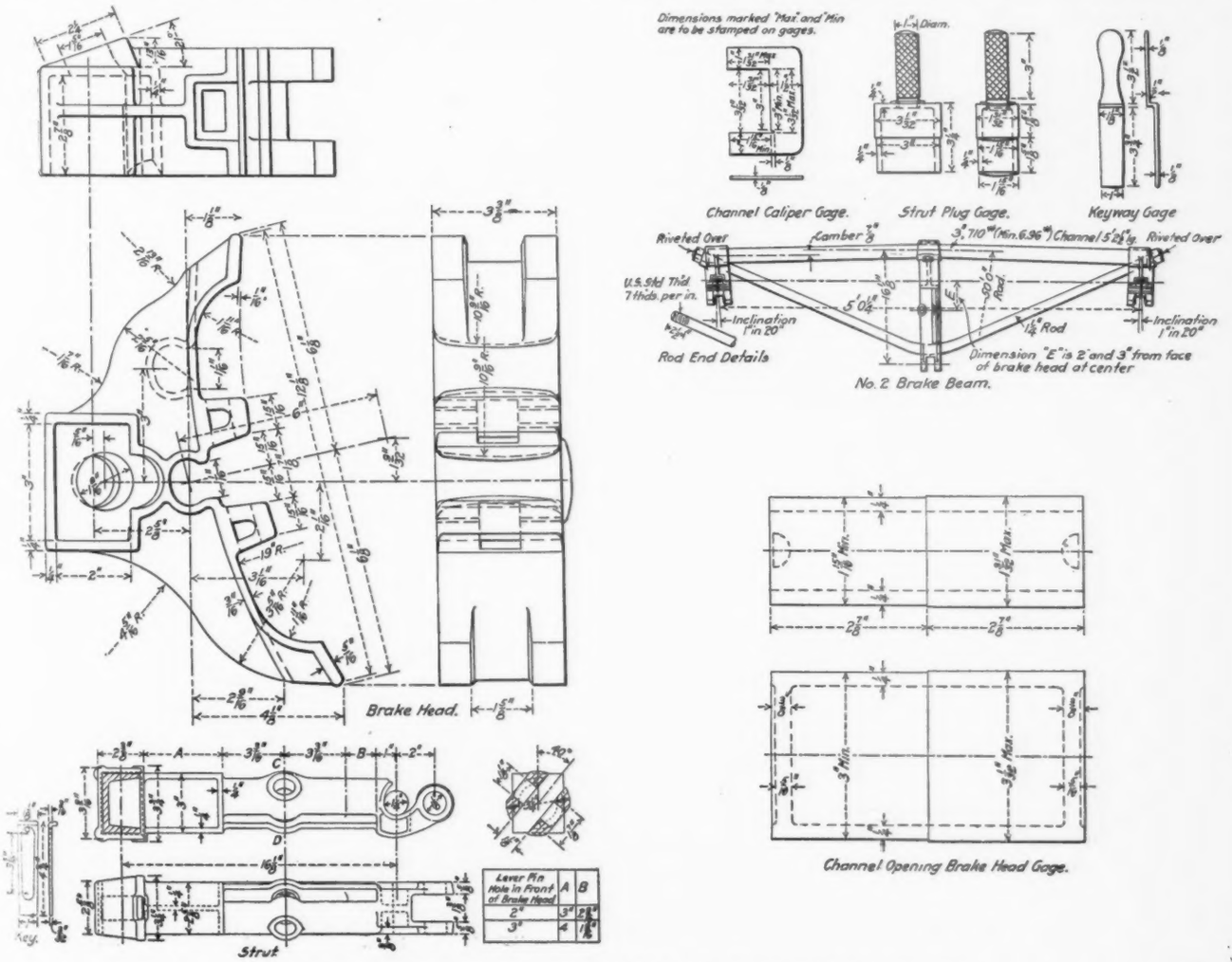


Fig. 2—Standard Brake Beam to be Adopted as Recommended Practice.

believe we will have very high flange wear due to the shoes crowding the fillet of the wheel if we close in the 60¼ in. dimension, and I would suggest that the subject be referred back to the committee for further consideration.

In view of the fact that the committee on brake beams investigated this subject at one time and we have had this practice in vogue for 5 years, I think it would be hasty to adopt a new dimension in view of the work that has gone before, and I would make an amendment that the subject of the dimension of 59¾ in. as the nominal length spacing of brake beam be referred to the committee on brake beams for further consideration, and report next year.

L. C. Ord (C. P.): The Air-Brake Association, I understand, have a committee on this subject, which has made a recommendation of 60 in. for the length of the beam and I ask if it would not be well to have that committee co-operate with this committee in investigating this subject, in order to determine the standard length?

Mr. Young: I think I may speak for the committee that they will be glad to co-operate with the committee of the Air-Brake Association in order to have the dimension made proper.

Mr. Gaines: I tried out that dimension by placing several beams with the old dimension, and with the shorter dimension on tenders, and followed the matter up by inspecting the brake beams regularly, and we found that we had less flange wear and brake shoe wear, and the thing worked much more evenly, with the shorter dimension than with the standard dimension.

C. A. Seley (C. R. I. & P.): I think that we should adopt the second portion of this report with the exception named. I would like to say just a few words about the new association brake beam. I am very much interested and gratified to note the progress in the matter of establishing a standard, but I am also persuaded that we are not ready to adopt this beam as recommended practice at this time.

Although the date of this report is April 18, indicating proper activity on the part of the committee, it was not in our hands for analysis until within the past week. Furthermore, I know that if this is adopted, that you make the new standard beam 15,000 lb. beam for No. 2, instead of 12,000 lb. beam, in fact, a 17,000 lb. beam, if you take the indication of the first part of the test, which is within the range of a No. 2 beam test.

In the short time I have had to look over the report of the committee, I am of the opinion that possibly it would pay us to spend a little more time in the analysis and working out of this standard beam.

There are a number of dimensions one way and another which make this beam a pretty fine haired one to manufacture, and I think that costs with us are regulated by the number of points which we have got to tie and possibly a little more investigation might develop the fact that some of these points are tied a little too closely. Just as an illustration of what I mean, I notice, for instance, in the No. 2 brake beam the radius of the compression member. Now, I believe that the ordinary method of assembling these beams is not to curve them before they are put in, but to make the curve in assembling the beam, and some captious inspector might find out it was not exactly 50-in. radius, and make an objection, and I think there is one measurement that might be eliminated, and possibly on further study of the design, we might be able to do something more in that line, and while I do not wish to be an obstructionist or discourage the adoption of a standard beam I think these points should have consideration.

I would, therefore, move that in accepting the report of the committee, and submitting it to letter ballot, that the matter of the new standard beam be referred back to the committee for further consideration with the idea that not only the committee, but the members of the association can have a better chance to check over and study the report of the committee.

Mr. Young: By reference of the report back to the committee, I presume that Mr. Seley is simply asking for time to ascertain whether the construction as here offered is a suitable one. So far as the detailed points which he raises are concerned, I might say that the beam is made in accordance with this drawing and with a 50-ft. radius of the compression member, the inclination of one in twenty of the head comes out exactly, and it is impossible to build a beam in accordance with the requirements of the association and with that inclination without giving the beam ⅞-in. camber, which is virtually the same as making it the 50-ft. radius.

I believe that the association should go slow in the case of any recommended practice design, and it may be good policy to defer any action, but I do not quite see what the committee can do. They have done their work, they have presented the drawings, and presented the results of tests, and they offered the beam as recommended practice. If the beam is found wanting, when adopted in recommended practice, it is a very simple matter for us to change it or eliminate such dimensions with regard to which elimination may be desirable.

I overlooked, previously, one point which Mr. Seley brought up, namely, that the tests show we have a 15,000-lb. beam. That is true. We have also tested beams similar to these, in our laboratory, and for the information of the members, I will say that some of the beams test 15,000 lbs.; in other words, we do not construct a beam which would be so close to the rejection limit that it would be handicapped under our specification, by rejection in re-testing, and the beam, in the opinion of the committee, is amply strong to meet the specified requirements, and if constructed in accordance with the drawing, no such difficulty will exist, and it is intended to be a 12,000-lb. beam.

Mr. Seley's motion was put and lost.

The President: Now, we will take a vote on the original motion, *i. e.*, to accept the committee's report and refer it to letter ballot, with the exception of the length of brake beam. The motion was carried.

CAR WHEELS.

At the convention in June, 1911, a number of recommendations were made relating to questions of standardizing solid steel and steel-tired wheels for freight and passenger cars. These subjects, together with other matters pertaining to the chilled cast-iron wheels were referred by the executive committee to this committee for action and recommendation. The subjects are briefly outlined as follows:

Prepare specifications and physical test for cast steel, rolled steel, forged and rolled steel, and forged steel wheels. Prepare drawings showing principal dimensions of cast steel, rolled steel, forged and rolled steel, and forged steel wheels. Prepare drawings showing a standard method of fastening for built-up steel-tired wheels. Prepare drawings showing proposed M. C. B. standard gage for measuring the thickness of service metal of solid steel and steel-tired wheels. Consider any changes or corrections necessary in specifications for chilled cast-iron wheels.

The most important work was the subject of specifications, dimensions and tolerances for solid forged and rolled, rolled or cast steel wheels for freight and passenger car service.

The committee requested the various makers of solid steel and steel-tired wheels to submit drawings and specifications for steel wheels now in service; also requested similar information from railways using steel wheels.

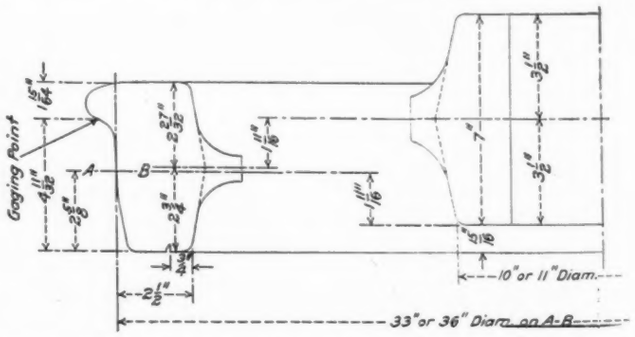
Realizing the advisability of coöperation between railways and the makers of steel wheels, the committee addressed the manufacturers suggesting a joint conference at Pittsburgh, Pa., December 8, 1911.

The proposed work of the committee was explained to them and met with general approval. It was brought out at this meeting that the present tendency pointed toward a number of different designs and specifications, instead of adopting as few standards as possible.

The committee was advised that a committee representing the wheel manufacturers and the American Society for Testing Materials was working jointly on designs and specifications for steel wheels. Specifications were prepared by this committee for freight and passenger wheels, copies of which were furnished to the M. C. B. committee. After reviewing them, the committee recommended a few changes in regard to tolerances, and the revised specifications will appear as an appendix to this report.

There are a number of questions relating to the chemical and physical properties of carbon and alloy steel, and method of treating and handling the steel in its process of manufacturing that are now being investigated.

On this account, the committee has thought it unwise to recommend a standard specification at this time, governing the



Fg. 1—Solid Steel Wheel for 4¼ in. x 8 in., 5 in x 9 in., and 5½ in. x 10 in. Axles.

quality of the material or the method of manufacturing solid steel wheels, and has only recommended the adoption of a specification governing the maximum variations that will be allowed in the fabrication of new wheels. This is shown in recommendation No. 1.

It will be noticed that only one specification has been recommended which applies to both passenger and freight car wheels. Attention is also called to the fact that the question of specifications for cast-steel, one-run wheels has not been considered at this time.

The committee submits as its second recommendation, drawings of 33-in. and 36-in. solid steel wheels for freight and passenger service, as shown in Figs. 1 and 2. As there is some

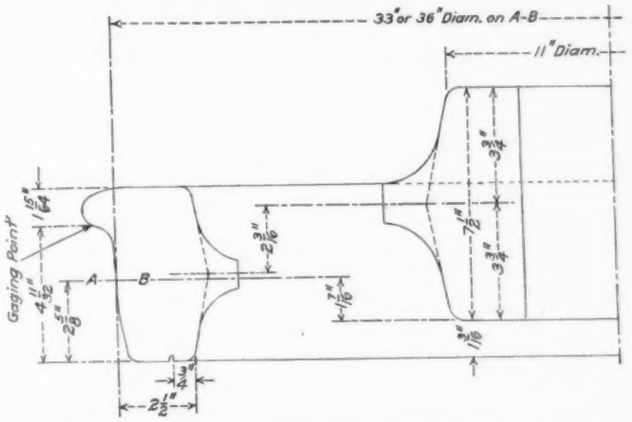


Fig. 2—Solid Steel Wheels for 6 in. x 11 in. Axles.

difference in opinion as to the correct shape of the plate of the wheels, this has not been shown, and no mention as to thickness of plate and its tolerance is made in the proposed specification.

It will also be noticed that two different hub diameters—10 in. and 11 in.—are recommended for wheels used on axles up to and including 5½ in. by 10 in., the use of either diameter to be optional with the purchaser.

On account of the necessity of allowing 1/16 in. tolerance below the specified thickness of flange due to inaccuracy in fabrication, the committee suggests as its third recommendation that the thickness of flange be increased, making the rim 5 19/32 in. wide instead of 5½ in., which is the present standard. This will make the contour of the tread and the flange of steel and steel-tired wheels same as the chilled cast-iron wheels, and the same mounting and check gages can be used.

Attention is called to the drawings showing the various gages that will be required in connection with the inspection of solid steel and steel-tired wheels.

In regard to the question of tire fastenings for steel-tired wheels, the committee has found that at the present time there are a great number of different methods used, and after careful consideration of this subject with the manufacturer of steel-tired wheels, it was suggested that a tire held by shrinkage and bolts be adopted as recommended practice as shown in Fig. 8.

This type of fastening, in the opinion of the committee, has the greatest merits of any in use, and is not covered by patents leaving it open for any manufacturer to produce. With this type of fastening cast-iron or cast-steel spoke or solid centers can be used.

In regard to the question of determining a proper physical test for the purpose of detecting internal strains in solid steel wheels, the committee, after due consideration of this subject, feels that it will be necessary to make further investigations and experiments before submitting a recommendation, and suggests that this will be a part of the committee's work for next year.

In reference to chilled cast-iron wheels, the committee has received from the Association of Manufacturers of Chilled Car Wheels several suggestions, which are as follows:

1. Drawing for chilled cast-iron wheels for cars of 140,000 lbs. capacity.

2. Increase thickness of flange 3/32 in. at base line, and compensate for this increase by mounting the wheels 3/16 in. farther apart, and change the mounting gage to suit.

3. Revision of weights of wheels for cars of 80,000 lbs. capacity.

4. Revision of paragraph in wheel specification relative to overweight at the manufacturer's expense.

5. Revision of M. C. B. wheel specification to include wheels for cars of 140,000 lbs. capacity.

6. Confine rejections on account of failure of test wheels to wheels represented by same tape size only.

7. Establish maximum breaking power as well as gross load for each design of wheel.

8. Revision of M. C. B. Rule 76 to specify depth to which freight should be worn hollow.

9. Revise the M. C. B. standard drawings for cast-iron wheels to show the standard size core. Also revise the standard wheel specification to the effect that overweight of wheels above the normal (due to hub core smaller than the standard) should be paid for by the purchaser.

The committee has carefully considered these recommendations and does not feel justified in recommending more than three of the changes at this time.

The question of increasing the thickness of the flange and mounting the wheels 3/16 in. farther apart is a matter which this committee can not pass upon or recommend.

In regard to the question of design and specification for a chilled cast-iron wheel for cars of 140,000 lbs. capacity, the committee has taken no action on this subject at this time.

In regard to the question of raising the weight for the 80,000 lb. capacity wheel, the committee has not found any good reasons for a change.

In reference to the suggestion relating to the overweight of wheels at the manufacturer's expense which is brought about by the clause in paragraph 9 of the present wheel specification, which reads: "All excess weight over the maximum given to be the expense of the manufacturer." The committee has carefully considered this matter and recommends that paragraph 9 in the present wheel specification be changed as shown by the committee's recommendations.

In regard to suggestion No. 6, your attention is called to the present specification, which states that two wheels picked at random from each one hundred wheels be tested, and if these wheels fail to pass any of the specified tests, the entire lot of 100 wheels represented by this test will be rejected.

It is asserted that the rejection of 100 wheels because the chill in either extreme tape size is unsatisfactory causes many good wheels to be rejected and works a hardship on the manufacturers.

The committee has carefully considered this matter, and a change in the specification is recommended, as shown in the committee's recommendations.

In regard to the question of establishing maximum breaking power as well as gross load for each design of wheels, this question was brought up and referred to in the recommendations of last year and had particular reference to the failures of cast-iron wheels used under cars of heavy tare weight, such as refrigerator cars.

The committee has considered this question again, and upon investigation found that the trouble experienced has been largely due to the fact that too light capacity wheels, as well as axles, are being used under refrigerator cars and cars with a marked capacity of 60,000 lbs. The majority of these cars have a tare weight of 40,000 to 47,000 lbs., bringing the total weight of the car and lading up to 117,000 lbs.

If the proper size axles, or 5 in. by 9 in., are used on these cars with a corresponding weight of wheels, it is the opinion of the committee that the trouble experienced with these cars will be eliminated, and the committee would again recommend that car owners and members of this Association give this subject careful consideration in purchasing new equipment or making renewals to old cars.

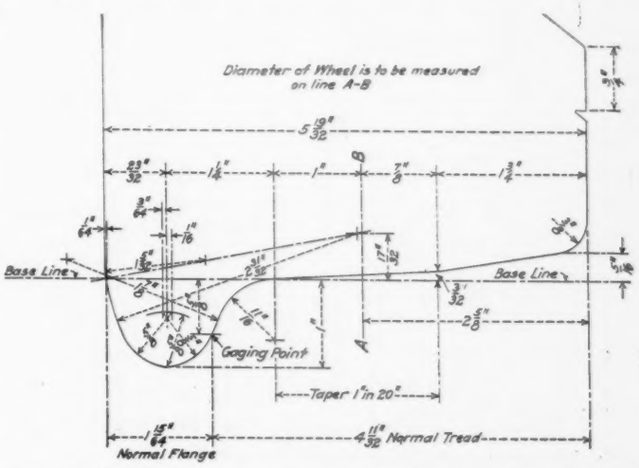


Fig. 3—Wheel Tread and Flange for Steel and Steel Tired Wheels.

RECOMMENDATIONS.

Recommendation No. 1.

The proposed specification governing the dimensions and tolerances for solid wrought-steel wheels for freight and passenger car service are as follows:

1. Wheels should be furnished rough bored and with faced hubs and have a contour of tread and flange as rolled or machined according to M. C. B. Recommended Practice (Fig 3). They should conform to dimensions specified within the following tolerances:

2. *Height of Flange.*—The height of flanges should not be more than ⅛in. over and must not be under that specified, or 1 in.

3. *Thickness of Flange.*—The thickness of flange shall not vary more than 1/16 in. over or under that specified.

4. *Thickness of Rim.*—The thickness of rim to be measured between the limit of wear groove and the top of the tread at the point where it joins the fillet at throat of flange. The thickness must not be less than 1¾ in., but may exceed this amount.

5. *Width of Rim.*—The width of rim shall not be more than ⅛ in. less, nor more than ⅛ in. over that specified.

6. *Limit of Wear Groove.*—The limit of wear groove to be located as shown in Fig. 3.

7. *Diameter of Bore.*—The diameter of rough bore shall not vary more than 1/16 in. above or below that specified. When not specified the rough bore shall be ¼ in. less in diameter than the finished bore subject to the above limitations.

8. *Hub Diameter.*—The hub diameter may be either 10 in. or 11 in. in diameter as specified, with a maximum variation of ⅛ in. above or below. The thickness of the wall of the finished bored hub shall not vary more than ⅜ in. at any two points on the same wheel.

9. *Hub Length.*—The length of hub shall not vary more than ⅛ in. over or under that specified.

10. *Depressions of Hub.*—The depression of the hub must be made so that the distance from the outside face of the hub to the line *AB* shall not exceed 1 11/16 in. for wheels used on 5½ in. by 10 in. axles and under, and 1 7/16 in. for wheels used on 6 in. by 11 in. axles.

11. *Black Spots on Hub.*—Black spots will be allowed within 2 in. of the face of the hub but must not be of such depth that they will not bore out and give clear metal at finished size of bore.

12. *Eccentricity of Bore.*—The eccentricity between the tread at its center line and the rough bore shall not exceed 3/64 in.

13. *Block Marks on Thread.*—The maximum height of block marks must not be greater than 1/64 in.

14. *Rotundity.*—All wheels shall be gaged with a ring gage made of 3 in. by ½ in. material, and the opening between the gage and tread at any one point shall not exceed 1/16 in.

15. *Plane.*—Wheel shall be gaged with a ring gage placed concentric and perpendicular to the axis of the wheel. All points on the back of the rim equidistant from the center shall be within a variation of 1/16 in. from the plane of the gage when so placed.

16. *Tape Sizes.*—Wheels shall not vary more than five tapes under nor nine tapes over the size called for.

17. *Mating.*—The tape sizes shall be marked in plain figures

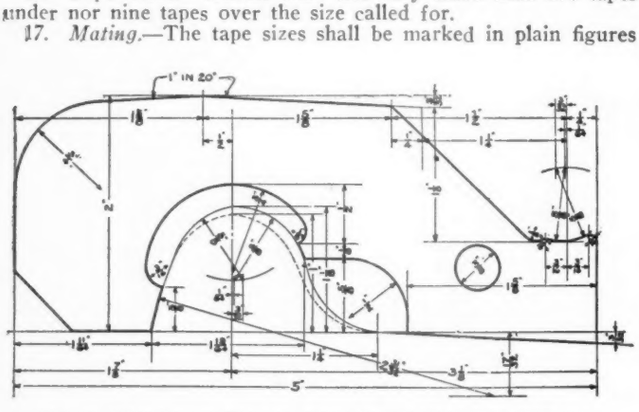


Fig. 4—Maximum Flange Gage for Solid Steel Wheels.

on each wheel. Wheels must be mated to tape sizes and shipped in pairs.

18. *Gage.*—Gages and tape used shall be M. C. B. standard as follows:

M. C. B. Standard wheel circumference measure, Sheet 16-A.
Maximum flange thickness gage, Fig. 4.
Minimum flange thickness gage, Fig. 5.
M. C. B. recommended plane gage, Fig. 6.
M. C. B. recommended gage for measuring service metal, Fig. 7.

19. *Branding.*—Wheels shall be stamped with date, heat number, maker's serial number and brand, also purchaser's name and serial number, if specified. The branding is to be done according to M. C. B. recommended practice.

20. *Inspection.*—The inspector representing the purchaser shall have free entry at all times, while his contract is being executed, to all portions of the manufacturer's plant. All reasonable facilities and necessary gages shall be afforded the inspector by the manufacturer to satisfy him that the wheels are being furnished in accordance with the specifications. All tests and inspection shall be made at the place of manufacture prior to shipment and free of cost to the purchaser. The purchaser shall have the right to make tests to govern the

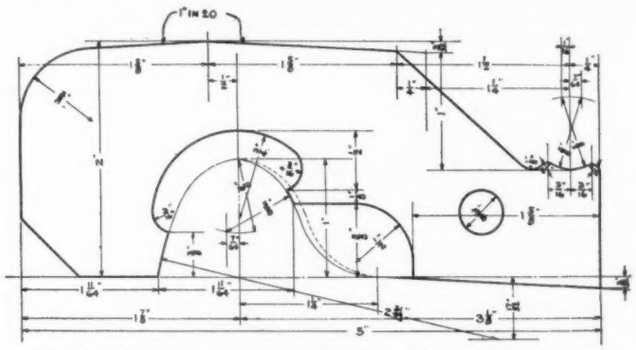


Fig. 5—Minimum Flange Gage for Solid Steel Wheels.

acceptance or rejection in their own test room or elsewhere as may be decided by the purchaser.

Samples of rejected material must be preserved at the laboratory of the purchaser for one month from the date of test report. In case of dissatisfaction with the results of the tests, the manufacturer must make claim for a rehearing (should he desire to do so) within that time. Tests and inspection shall be so conducted as not to interfere unnecessarily with the operation of the mill.

Recommendation No. 2.

It is recommended that the size and dimensions for solid steel wheels for freight and passenger cars be adopted as shown on the following drawings:

33-in. and 36-in. solid steel wheels for 4¼ in. by 8 in., 5 in. by 9 in. and 5½ in. by 10 in. axle, Fig. 1.

33-in. and 36-in. solid steel wheel for 6 in. by 11 in. axle, Fig. 2.

Recommendation No. 3.

It is recommended that the thickness of flange for steel and steel-tired wheels be increased 3/32 in., making the contour to the base line same as the cast-iron wheels, as shown in Fig. 3, herewith, and it is recommended that this cut be shown as Fig. 5 on Sheet *C*, M. C. B. Recommended Practice in place of the present cut.

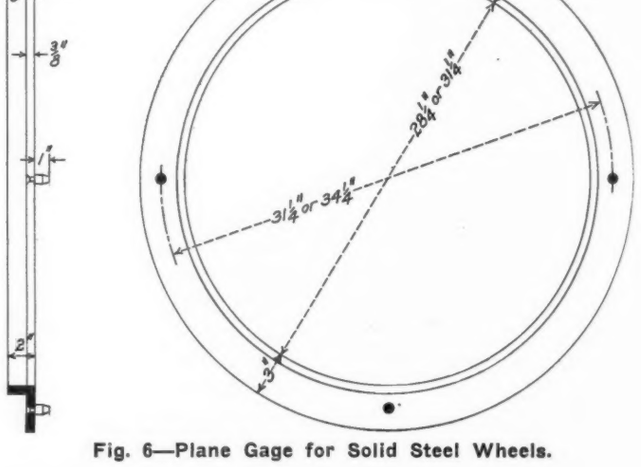


Fig. 6—Plane Gage for Solid Steel Wheels.

Recommendation No. 4.

As it is found desirable to have a gage for measuring the thickness and height of flanges as well as throat radius of steel wheels, it is recommended that the present maximum and minimum flange thickness gage shown on M. C. B. Sheet 16 be changed and made similar to that shown in Figs. 4 and 5. This will give a maximum and minimum flange thickness gage that is the same for either cast-iron, solid steel and steel-tired wheels, and also a maximum and minimum height and throat radius for steel wheels.

Recommendation No. 5.

It is recommended that a rotundity gage be adopted for the purpose of measuring the maximum distance that wheels are out of round, which shall be 3 in. wide and ½ in. thick.

Recommendation No. 6.

It is recommended that a plane gage for the purpose of measuring how much wheels are out of plane be adopted, as shown in Fig 6.

Recommendation No. 7.

It is recommended that a gage be adopted for the purpose of measuring the thickness of the rim above the limit of wear groove, as shown in Fig. 7. With this gage it is possible to measure direct the amount of metal necessary to remove to restore the tread to M. C. B. contour. It is also possible to measure direct the amount of service metal remaining above the condemning limit after the tread is restored to M. C. B. contour.

Recommendation No. 8.

It is recommended that a standard fastening for all steel-tired wheels be adopted, as shown in Fig. 8.

Recommendation No. 9.

It is recommended that a standard method of branding all steel wheels be adopted, as previously described.

The following changes in the present specifications for cast-iron wheels are recommended:

Recommendation No. 10.

The sixth clause under paragraph No. 4 reads as follows:

"Should the test wheel stand the given number of blows without breaking in two or more pieces, the inspector will then subject the other wheel to the following test."

It is recommended that this sentence be changed to the following:

"Should the test wheel stand the given number of blows without breaking in two or more pieces, the drop test will be satisfied and the inspector will then subject the other wheel to the following test."

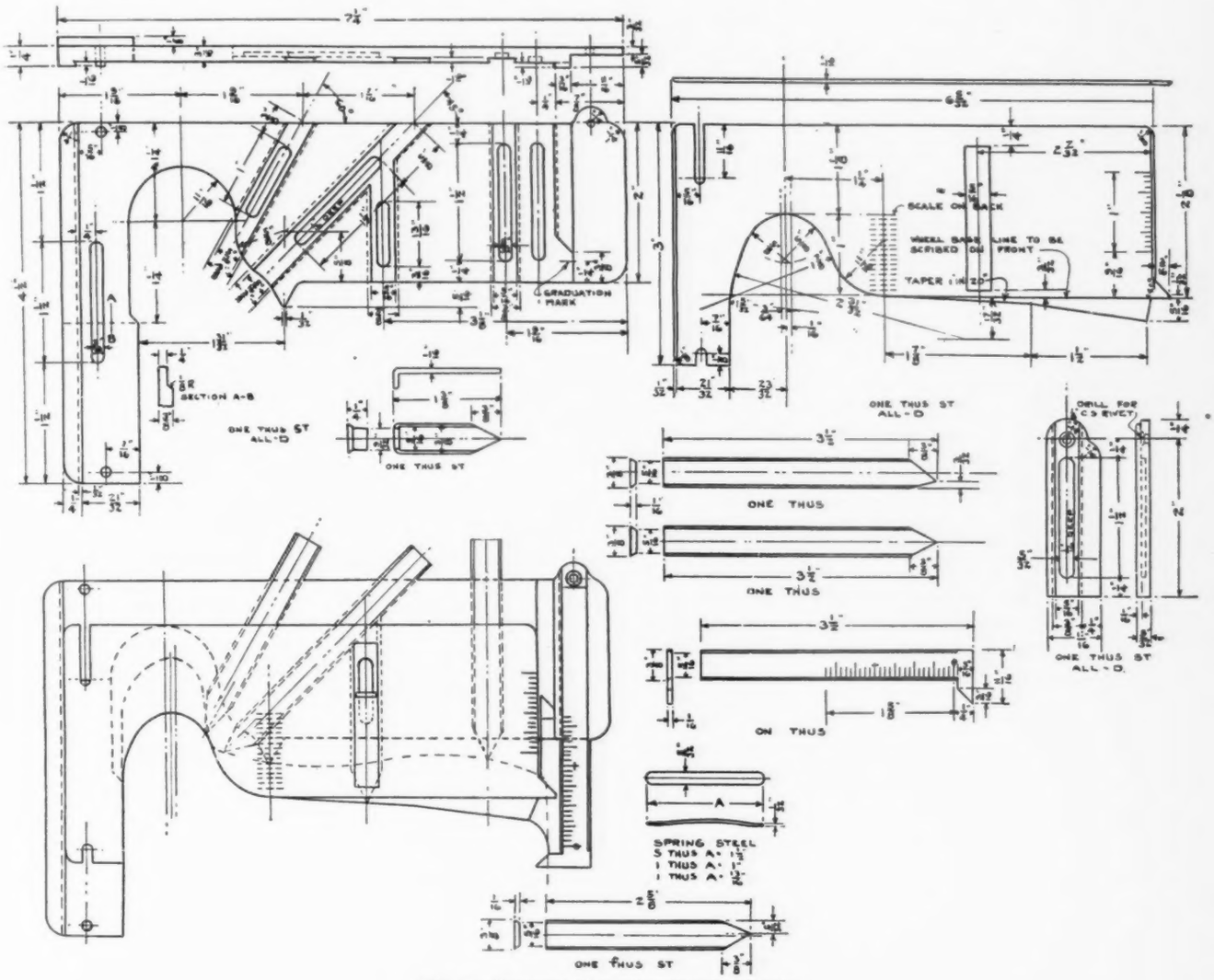


Fig. 7—Contour Gage for Steel Wheels.

Recommendation No. 11.

The last sentence in the seventh clause of paragraph No. 4 now reads as follows:

"If the wheel is found broken in pieces, or if any crack in the plate extends through or into the tread, the 100 wheels represented by the test will be rejected."

It is recommended that this sentence be changed to the following:

"If the wheel is found broken in pieces, or if any crack in the plate extends through or into the tread, all wheels of the same tape size as the broken wheel will be rejected."

Recommendation No. 12.

It is recommended that paragraph No. 9, of the present specification, be changed to the following:

"Individual wheels will not be accepted which:

"(1) Do not conform to standard design and measurements.
"(2) Are under minimum weight.
"(3) Have physical defects described in Section 2.

"If in any lot of 100 wheels submitted to test, the test wheel fails to meet the requirements of the drop, chill, or thermal test, then all of the wheels in tape number and weight corresponding to the test wheel will be rejected. In case the rejection is for high chill, weak breaking strength, or failure in the thermal test, the test will be continued in the next higher

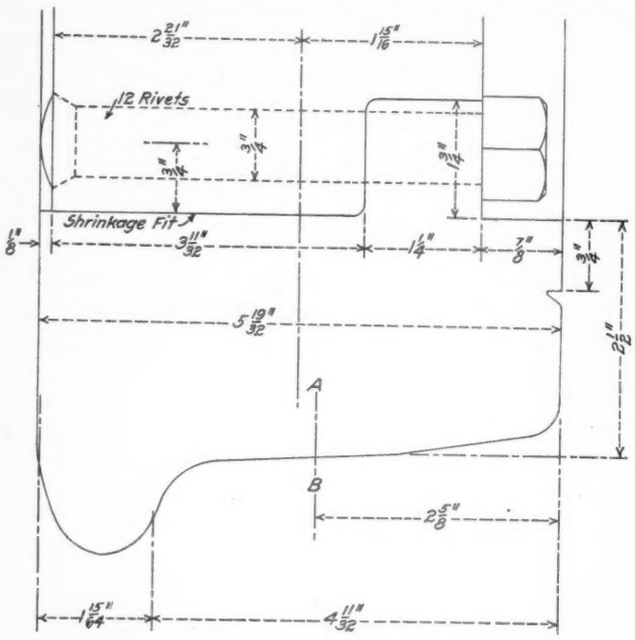


Fig. 8—Proposed Tire Fastening for Steel Tired Wheels.

number of tape size, or if the rejection is for low chill, the test will be continued in the next lower number tape size.

"In any shipment where the average weight of wheels is above the maximum weight of wheels the excess weight to be at the expense of the manufacturer.

"In case wheels ordered with cores smaller in diameter than the standard, the additional weight should be considered as an addition to the normal weight and paid for by the purchaser."

Recommendation No. 13.

It is recommended that the letters *A B* be added to the measuring line 2⅝ in. from the outside rim of the wheel to the drawing of the 625-lb. cast-iron wheel M. C. B. Sheet *N*, of the 675-lb. cast-iron wheel M. C. B. Sheet *O*, and the 725-lb. cast-iron wheel M. C. B. Sheet *P*.

Recommendation No. 14.

It is recommended that the following clause be added to the Code of Rules for the Interchange of Traffic:

"Rule 76A. Height of flange.—If the height of flange is 1½ in. or greater."

Recommendation No. 15.

It is recommended that the standard size of cores for cast-iron wheels be shown on the drawings of same as follows:

M. C. B. Sheet *M* Recommended Practice, for cast-iron wheels for 60,000-lb. cars. Add the following clause:

"Standard core 5¼ in. diameter."

M. C. B. Sheet *O* Recommended Practice, for cast-iron wheels for 80,000-lb. cars. Add the following clause:

"Standard core 6 in. in diameter."

M. C. B. Sheet *P* Recommended Practice, for cast-iron wheels for 100,000-lb. cars. Add the following clause:

"Standard core 6½ in. in diameter."

The above notations to be placed under the dimensions of the finished bore.

The report is signed by:—Wm. Garstang (C. C. C. & St. L.), chairman; W. C. A. Henry (Penna.); A. F. Manchester (C. M. & St. P.); R. W. Burnett (C. P.); R. L. Ettenger (So. Ry.); O. C. Cromwell (B. & O.) and J. A. Pilcher (N. & W.).

APPENDIX.

An appendix follows showing a portion of what the American Society for Testing Materials has drawn up as proposed standard specifications for forged and rolled, forged, or rolled solid carbon steel wheels for engine truck, tender, freight and passenger service.

A.—Manufacture.

1. *Process.*—The steel shall be made by the open-hearth process.

2. *Discard.*—The ingots from which the blanks are made shall have sufficient discard to insure freedom from injurious piping and undue segregation.

B.—Chemical Properties and Tests.

3. *Chemical Composition.*—The steel shall conform to the following requirements as to chemical composition:

	Acid.	Basic.
Carbon	0.60 to 0.80	0.65 to 0.85 per cent.
Manganese	0.55 to 0.80	0.55 to 0.80 per cent.
Silicon	0.15 to 0.35	0.10 to 0.30 per cent.
Phosphorus	not over 0.05	not over 0.05 per cent.
Sulphur	not over 0.05	not over 0.05 per cent.

4. *Chemical Analysis.*—To determine whether the material conforms to the requirements as to chemical composition specified in Section 3, an analysis shall be made from a test ingot taken during the pouring of each melt. A copy of this analysis shall be given to the purchaser or his representative.

A check analysis may be made by the purchaser from one wheel representing each melt, and this analysis shall conform to the requirements specified in Section 3. A sample may be taken from any one point in the plate; or two samples may be taken, in which case they shall be on radii at right angles to each other. Samples shall not be taken in such a way as to impair the usefulness of the wheel. Drillings for analysis shall be taken by boring entirely through the sample parallel to the axis of the wheel; they shall be clean and free from scale, oil and other foreign substances. All drillings from any one wheel shall be thoroughly mixed together.

Mr. Garstang presented the report and at its conclusion said:

Since this report was written, we find there are some roads using a 38-in. diameter wheel in passenger service. If you will refer to recommendation No. 2, of the committee's report, you will notice that the committee only recommends two standard wheels, one 33 in. in diameter, and one 36 in. in diameter; and those dimensions are to cover both passenger and freight service. In view of the fact that several roads use a 38-in. wheel, as standard, I feel, as a member of the committee, that we should have included a 38-in. wheel, and with the consent of the association, the wheel committee would be very glad to submit a drawing of a 38-in. wheel provided with the necessary dimensions and give it a classification.

I have spoken to some of the members of the standing committee on car wheels, and they agree to this, and we can furnish a drawing of the 38-in. wheel with the necessary dimensions, and exhibit the classification to the secretary in time to be printed with the proceedings if the association will agree to it.

The President: If there are no objections, the committee may submit drawings for 38-in. wheel.

DISCUSSION.

H. LaRue (C. R. I. & P.): I would like to see a drawing made of the lettering to be used on the wheel as mentioned in recommendation No. 9. I do not think we should allow the manufacturer to use anything but a standard figure and letter.

The President: Is that satisfactory to you, Mr. Garstang?

Mr. Garstang: Yes. You would like that to be presented and be a part of the committee's report?

The President: Part of the wheel committee's report.

Mr. Hennessey: I move that the report of the standing committee on car wheels be accepted and approved with the thanks of this association

The Secretary: I ask Mr. Hennessey if his motion is intended to mean that the report of the standing committee on car wheels be received, and the recommendations contained in the report be submitted to letter ballot.

C. D. Young (Penna.): In Fig. 8, showing the contour of steel-tired wheels and the method of fastening them to the center, I would like to say a word. We have had some experiences with this method of fastening, and feel it is about the best which can be used, but on investigation of some of the cars under which we have steel-tired wheels, in which this method of fastening has been used, we have found detail fractures have started through the bolt hole wall on account of the lack of metal between the bolt hole and the inner diameter of the tire,

Referring to this illustration you will see that the dimension is ⅛in. If the workmen in the shop are not very careful in drilling out the 12 ¾-in. holes through the tire, they may encroach upon that ⅛ in. and you have no material between the bolt hole and the inner wall of the tire. I do not believe it would add anything at all to the weight of the wheel in arbitration to increase the 1¼ in. dimension to 1⅜ in. and that would give ¼ in. of material between the edge of the bolt hole and

the inner diameter. In view of the fact that we have had wheels fail, due to detail fractures starting in this location, I would like to offer Mr. Garstang the suggestion of increasing that dimension from 1¼ in. to 1⅜ in.

Mr. Garstang: It is a matter of opinion and experience. If the sentiments of the members of the association are that this change should be made, we will be glad to make the change.

I. S. Downing (L. S. & M. S.): We had the same experience as referred to by Mr. Young with this style of wheel and we had one serious wreck on account of wheel failure, on account of the bolt holes being bored too close to the inside walls.

Mr. Garstang: I think one of the good features of this design is the amount of flat bearing surface that you have got between the center and the tire; that is, the tire largely depends on shrinking. The bolt that you put in is simply to hold the tire in case of the failure of the bearing. While it may be beneficial to increase that distance at that point, I cannot figure out how.

Mr. LaRue: I would like to ask the chairman of the wheel committee if he has heard any objection to the dropping of the contour of the throat of the wheel to 5/16-in. on the outside. I believe there has been some trouble under certain conditions. I would like to ask if anybody else has had any trouble in this respect?

Mr. Young: In answer to Mr. Garstang, the increase of that dimension will not affect in any way the bearing of the tire on the center. It merely affects the lug which is a part of the tire to which the retaining bolts are secured. If, in the drilling of these holes, any error takes place, we practically have a drilled hole at the inner wall of the tire which will start a detailed fracture through that bolt hole. We have had that experience.

The President: Are there any members who can answer Mr. LaRue in regard to trouble with the dropping of the contour of the wheel?

D. E. Fitzgerald (St. L. & S.): We have had two wrecks on our lines where the change in the contour has been advanced for the reason of the derailment on the theory that where the rails are a little wide gage, the sharp contour has a tendency to form a wedging motion, and that causes the flange on the other side to crowd and climb on the rail. That is particularly true of new cast wheels, where the flange is rough, and the flange is shallower than formerly, and I have also heard it advanced in the case of steel-tired wheels.

L. C. Ord (C. P.): I ask Mr. Young if he will explain just what trouble these detailed fractures caused. It should be bone in mind that the addition of metal to the tire to the ¼-in. dimension, would mean an increase of metal which would have to be paid for on all tires in service, and would not be warranted unless the detailed fractures to which Mr. Young refers are relatively important. I cannot see how the fractures can occur if the tire is properly secured to the center. I would also ask if the error in drilling would mean an error on one hole or on all the holes in the center, as that is practically what would have to happen to appreciably weaken the fastening. I also cannot see how a detail fracture in the holes could occur unless the tire were loose and working on the center.

Mr. Young: Some of these failures which have come up from this cause, have been due to a thin wall there, detail fractures having taken place. Where the hole has been supported by sufficient material between the inner edge and the bolt hole, the detail fractures have not started. The driving fit of the bolt probably tends to spread that metal a little bit. it is only ⅛ in. by 1¼ in., and you can see there is not very much strength there to hold up the driving fit of a bolt.

Mr. Garstang: In answer to the gentleman who has just spoken, I would say, that has the full backing up of the center, and it is supposed that that lug has the same shrinkage as the balance of the tire, and if it has, you practically have solid metal; and, personally, I do not believe it would make any difference if it was only 1/16 in. thick at that point.

The President: Gentlemen, you have heard Mr. Hennessey's motion that the report of the standing committee on car wheels be received and the recommendations contained in the report submitted to letter ballot.

The motion was carried.

Telegraphic advices from Brussels announce the removal of the discrimination which has existed against American lubricating oils in connection with public tenders for supplies for the Belgian state railways. The specifications for supplies have in the past called for Russian oils, thus preventing American oils from competing. The action of the Belgian government follows representations on the subject of American lubricating oils made by the United States government.—*Consular Report.*

HONORARY AND ASSOCIATE M. C. B. MEMBERSHIP.

Harry Coulter, inspector of the Philadelphia, Baltimore & Washington, made application yesterday to become an honorary member of the M. C. B. Association. Mr. Coulter, having been a member since 1891, being a period of 21 years, is eligible to election to such membership, and the convention will vote on his application on Friday.

It will also ballot on Friday for the election, as an associate member, of Prof. Edward C. Schmidt, of the University of Illinois. Professor Schmidt made his application last year, and in accordance with the rules of the association action was deferred until this year.

TRANSPORTATION FOR RETURN RAILWAY TRIPS.

Through Secretary Taylor, the Pennsylvania has notified the railway members of the M. C. B. and M. M. associations wishing transportation home over the lines of the Pennsylvania Railroad or the Pennsylvania Lines West, that such transportation will be provided if they hand their names to Secretary Taylor. Owing to the requirements of the law, this transportation must be limited to bona fide railway officials, and cannot include members of belt lines, or car lines or switching roads operated by industries.

The Central of New Jersey offers the same courtesy to those members of the two associations who wish to return over the Central of New Jersey or the Reading. A special train of parlor cars for New York will leave Atlantic City at 2.30 o'clock on Wednesday afternoon, June 19.

"PAPA WILL NOT DANCE TO-NIGHT."

[In order that the following may not be taken by the censors of the conventions as historic verity, we hasten to explain that it is what the ex-poet laureate of the mechanical conventions imagined in Chicago would happen in Atlantic City as a result of the abolition of the grand balls, one of which, under the unexpurgated programme, would have occurred to-night.—Editor.]

Slowly Jersey's sun was setting (it sits 'round all day),
Making all the land an oven, hot enough to scorch marsh hay;
And its rays had raised some blisters on a man and maiden fair;
He was mopping off his forehead, she was fixing her back hair;
She with bowed head, sad and thoughtful; he with face serene and bright,
Struggling to keep back the gurgle, "Papa will not dance to-night."

"Papa," Bessie's white lips faltered, pointing to Young's new pier,
With its strings of incandescent, tinting wavelets far and near.
"There's a fellow on the Boardwalk, one who wants to waltz with me,
And there isn't any music; it's so tiresome, don't you see?"
Papa kept his features solemn, but his eyes grew strangely bright
As he murmured through his whiskers, "Papa will not dance to-night."

"Bessie," calmly spoke her papa—and his accents made her sad,
Though he had some little trouble not to show that he was glad—
"Every year until the present I've put on my evening togs,
Hung around till nearly daylight, like the bumps upon the logs;

I have done my duty reg'lar, tried to do just what was right,
But I tell you I am tickled; Papa will not dance to-night."

Mad her eyes and sad her features, red and freckled was her nose,
But she said in self-communion, "Wonder why I brought my clothes?"
She had read Joe Taylor's programme and had felt inclined to scoff.
"At the present year's conventions neither grand ball will come off,
And there won't be any music—(dough therefor is not in sight);"
But she muttered through her ivories, "Bessie's going to dance to-night."

Hied she to the Hotel Rudolf, rode up to an upper floor,
Decked herself in gorgeous raiment, though she knew her dad was poor,
And their rooms were near the skyline; (this year Daddy paid the shot,
And he couldn't stand the Marlborough—last year could as well as not);
Then she rollered down the Boardwalk, whispering in the evening light—
"Curses on their stingy programme—Bessie's going to dance to-night!"

She has reached the Marlborough-Blenheim, dodging through the roller chairs,
Found a little crowd assembled standing round in groups and pairs,
And the orchestra beginning—she had heard the strains before—
But the old man ducked his coco and slid out another door.
Shall she follow him? Not any. Flashed her eyes with sudden light—
"Let him go and get real woozy! Bessie's going to dance to-night!"

In she sailed and caught a partner. (It is possible he thought
He had asked her for the favor—but, no matter, he was caught).
Then she waltzed and two-stepped gaily, while the old man, down the hall,
Met a friend and guessed a high one was the grandest kind of ball.
And they chuckled as they ordered—guessed the present plan was right:
"Lets the old guys have a show in—papas do not dance to-night."

It was o'er. The strings stopped playing and the maiden rode once more
In a wheel chair up the Boardwalk (thought her pa had gone before);
And she felt a glow of pleasure, notwithstanding weary feet,
That she'd had the dance she wanted and had managed it so "neat,"
Notwithstanding the committee had determined to "run light,"
And she murmured to her mirror, "Bessie had her dance to-night."

In the early hours came Papa; thanks to roller chairs and guide,
He had run the Boardwalk safely, nor fell off on either side;
Through the door Bess tells her story; asked how he'd enjoyed his eve;
(Didn't know where he was going, though she thought she saw him leave).
Papa chucked a silly chuckle as he fumbled with the light,
And replied to Bessie's query, "Papa dijn't dansh t'night."

—F. W. Lane.

BALL GAME RESULTS IN PAST YEARS.

This will be the tenth year in which the ball game has been an annual feature of the conventions. The games in 1908 and 1909 were between the railway men and the supply men, and in the former the supply men won, 25 to 19; in the latter, the railway men, 14 to 12. In all the other years the battles have been between East and West, and the following have been the scores:

	East.	West.
1903	11	5
1904	7	11
1905	18	17
1906	7	17
1907	1	23
1910	15	0
1911	15	1

It will be seen that the East has won four times and the West three times in the seven years. The only year when the score was close was 1905, when it was 18 to 17.

NORFOLK & WESTERN STEEL CAR ORDER.

The Norfolk & Western has ordered 10 steel postal, 8 combination baggage and mail and 6 combination baggage and express cars from the Pressed Steel Car Company, Pittsburgh, Pa., and 35 steel coaches and 5 combination passenger and baggage cars from the Harlan & Hollingsworth Corporation, Wilmington, Del. This is the first order for all-steel cars ever placed by the Norfolk & Western.

MAJOR SYMINGTON.

Major W. Stuart Symington, father of the "Symington boys" so well known to many of us here at Atlantic City, died suddenly early on Sunday evening. He had been playing golf and was on his way from the Elkridge Kennels to his home in Baltimore when he was stricken with apoplexy.

Major Symington was 73 years old, but carried his years lightly. To his seven sons he was more like an elder brother. He enjoyed nothing better than attending these annual conventions and keeping in touch with the friends of associates of his sons.

The following editorial, from *The Sun*, of Baltimore, headed "The Loss of a Man," is a fitting tribute to Major Symington:

"Each era has its special pattern and fashion in the matter of gentlemen, and, though we have made great progress in most directions, we cannot but feel, when we record the death of such a man as Major W. Stuart Symington, that the old pattern and fashion was one of peculiar beauty and nobility, and one which with unfeigned regret we see vanishing forever. Major Symington was one of the last of the splendid type of a former generation of Marylanders who combined the outward courtliness and consideration of a more gracious and graceful period with the brave and generous qualities that appeal to the heart and the imagination in every age. It was a rare creation, whose roots went back to an even older civilization than its own, and drew heroic inspiration from a day of knightly ideals and traditions. It was men of this kind, intense, unswerving, unchanging in their loyalty, in their convictions, in their devotion to a cause or principle once espoused, that made splendid the pages of English history and fiction; it was men of the same uncompromising kind that made the Maryland Line famous in the Revolution; it was men like him who put Maryland

again in the front rank of battle during the Civil War and made Gettysburg a glorious disaster to the Confederacy. We bid these survivors of a day that is dead farewell with genuine regret as they pass away, one by one, and cherish the hope that if we of this generation cannot be altogether as they were, we may not lose entirely the inward grace that made them so kindly and attractive, nor the burning zeal and undoubting faith that sometimes made even their errors seem better than other men's cold-blooded truths.

"Major Symington was a good citizen as well as a brave soldier and a true gentleman. He was loved, respected and admired even by those who differed from him radically on every subject, and his passing is a loss not only to his associates and friends, but to the city and State, which is poorer by the death of one true man than by the destruction of much material treasure."

INVITATION TO MASTER STEAM AND HOT WATER FITTERS' ASSOCIATION.

The Master Steam and Hot Water Fitters' Association of the United States held their convention yesterday at Atlantic City. A special invitation to attend the convention and partake of all the privileges of the pier was extended to the association by the Railway Supply Manufacturers' Association.

THE DANCE LAST NIGHT.

The social gathering in the Blenheim exchange last evening was followed by an informal dance in the solarium. It was the evening on which the reception to officers of the M. C. B. Association and their wives has been given in past years, and the number participating in the dancing was about as large as on the evening of the first day of the conventions in past years.

MRS. FULLER SERIOUSLY ILL.

The following letter from C. E. Fuller, assistant general manager of the Union Pacific, second vice-president of the Master Car Builders' Association, and past president of the Master Mechanics' Association, was read at the opening session of the M. C. B. Association yesterday:

AT CHICAGO, June 9, 1912.

My Dear Mr. Stewart:

Owing to the serious illness of Mrs. Fuller, who is now in the Michael Reese Hospital at Chicago, I feel my first duty is to her, which will prevent my attending and taking part in the meeting of the M. C. B. Association at Atlantic City this year. Will you please explain to the members of the association the reason for my non-attendance.

Wishing for the association one of the best meetings it has ever had, I remain,

Yours very truly,

C. E. FULLER.

The association, by unanimous vote, extended its sympathy to Mr. Fuller.

Mr. Fuller will be seriously missed from the meeting this year, and the DAILY unites with Mr. Fuller's many friends in wishing Mrs. Fuller a speedy and thorough recovery.

The railway from Hangchow, China, to Ningpo, will be 120 miles long and will have a gage of 4 ft. 8½ in. The concession was granted to a British and Chinese corporation. Construction work was started at Ningpo, but had to be abandoned on account of financial difficulties.

M. C. B. REGISTRATION.

Acker, Chas. L., Toledo Terminal, Lexington.
Alter, William, Central R. R. of N. J., Edison.
Andrews, S. B., Seaboard Air Line Ry., Dennis.
Anthony, F. S., Texas & Pacific, Traymore.
Arp, W. C., Vandalia, Marlborough-Blenheim.
Ayers, A. R., N. Y. C., Lines West, Marlborough-Blenheim.
Barnes, P. H., Balto. & Ohio R. R., Pennhurst.
Barrett, R. W., Norfolk & Southern Ry., Arlington.
Bartlett, Henry, Boston & Maine R. R., Brighton.
Beaghen, Thos., Union Tank Line, Chelsea.
Beattie, J. A., McKeesport Connecting R. R., Seaside.
Beaumont, H. A., B. & O. R. R., Young's.
Bentley, W. F., B. & O. R. R., Shelburne.
Billinahm, R. A., Pittsburgh, Shaw & Nor. R. R., Lexington.
Bottomly, Edw. S., Lexington.
Brandt, C. A., C. C. C. & St. L. Ry., Marlborough-Blenheim.
Brown, M. G., Gulf & Ship Island R. R., Haddon Hall.
Bundy, C. L., D. L. & W. R. R., Lexington.
Burch, J. J., N. & W., Seaside.
Callahan, J. P., E. J. & E., Edison.
Carmer, J. R., P. B. & W. R R., Haddon Hall.
Carr, W. K., Norfolk & Western Ry., Dennis.
Carroll, J. T., Baltimore & Ohio R. R., Marlborough-Blenheim.
Carson, G. E., N. Y. C. & H. R. R. R., Traymore.
Case, S. T., N. Y. C. & H. R. R. R., Pennhurst.
Chaffee, F. W., N. Y. C. & H. R. R. R., Dennis.
Chambers, C. E., Cent. R. R. of N. J., Dennis.
Chambers, J. S., Coast Line R. R., Marlborough-Blenheim.
Clark, F. H., B. & O. R. R., B. & O. S. W. R. R., Marlborough-Blenheim.
Clark, J. H., Staten Is. Rapid Transit Ry., Marlborough-Blenheim.
Clark, J. J., Tennessee Central R. R.
Cleaver, F. C., Rutland R. R., Marlborough-Blenheim.
Contant, M. R., Ulster & Dela. R. R., Shelburne.
Cook, G. R., Penna. Lines West, Brighton.
Courson, J. F., Brighton.
Craig, Andrew, B. & M. R. R., Young's.
Craig, James, B. & M. R. R., Young's.
Cromwell, O. C., B. & O. R. R., Marlborough-Blenheim.
Curran, J. W., B. & O. S. W. & C. H. & D., Haddon Hall.
Davis, Geo. G., C. C. C. & St. L. Ry., Dunlop.
Davis, Jas., Penna. R. R., Chalfonte.
Davis, M. J., Penna. R. R., Chalfonte.
Demarest, H. N., Penna. R. R., Young's.
Dickerson, S. K., L. S. & M. S. Ry., Marlborough-Blenheim.
Dickinson, F. W., Bessemer & Lake Erie R. R., Monticello.
Eberle, Wm. F., Penna. R. R., Chalfonte.
Eell, E., Norris & Co., Chalfonte.
Elmer, Wm., Penna. R. R (B. & A. V. Div.), Chalfonte.
England, Robt. H., Central Ry. of Oregon, Marlborough-Blenheim.
Ettinger, R. L., Southern Ry. Co., Dennis.
Fitzgerald, D. E., St. Louis & San Francisco, Haddon Hall.
Fowler, G. L., Dennis.
Friese, N. L., Norfolk & West Ry., Seaside.
Fritts, J. C., Dela. Lack. & Western R. R. Co., Traymore.
Fryer, C. V., N. Y. O. & W. R. R., Traymore.
Garstang, Wm., C. C. C. & St. L. Ry., Marlborough-Blenheim.
Goodnow, T. H., Armour Car Lines, Marlborough-Blenheim.
Graburn, A. L., Can. Northern Ry., Traymore.
Graham, Chas E., Central R. R. of Oregon, Marlborough-Blenheim.
Gray, B. H., Orleans, Mobile & Chicago, St. Charles.
Hainen, J., Southern Ry., Dennis.
Hall, W. H., C. R. R. of N. J., Hotel Arlington.
Hamilton, Tabor, Cumberland Valley R. R., Chalfonte.
Harris Wells, N. Y. N. H. & H. R. R., Chester Inn.
Hartman, F. B., Southern Ry., Arlington.
Hayes, A. C., New York Central Lines, Pennhurst.
Henry, W. C. A., Penna. Lines West, Dennis.
Horrigan, John, Elgin, Joliet & Eastern Ry., Traymore.
Jackson, O. S, Chicago, Terre Haute & Southwestern Ry., Young's.
James, J. M., Penna. R. R. (West Penna. Div.), Marlborough-Blenheim.
Justus, I. J., St. J. C. & H. R. R. R., Pennhurst.
Kantmann, A. G., Nashville, Chattanooga & St. Louis, Runnymede.
Keagy, C. O., Penna. R. R., Haddon Hall.
Kent, F. S., Penna. R. R., Marlborough-Blenheim.
Kiessel, W. F., Penna. R. R., Chelsea.
Kipp, A., N. Y. O. & W. Ry., Lexington.
Kleine, R. L., Penna. R. R., Dennis.
Kneass, S. L., Wm. Sellers & Co., Chalfonte.
Knight, W. E., Cuba R. R., Traymore.

La Rue, H., C. R. I. & P. Ry., Traymore.
Lewis, W. H., Norfolk & Western Ry., Marlborough-Blenheim.
Lovell, Alfred, Traymore.
Lynn, Samuel, P. & L. E. R. R. Pennhurst.
MacBain, D. R., L. S. & M. S. Ry., Marlborough-Blenheim.
Marden, J. W., Shelburne.
Malott, F. W., Northern Pacific Ry., Chalfonte.
McCully, B. N., N. Y. Philada & Norfolk Ry., Haddon Hall.
McElvaine, C. L., Penna. R. R. Co., Brighton.
McKinsey, C. R., Phila. Balt. & Wash. Ry., Runnymede.
McNulty, F. M., Monongahela Connecting R. R., Chalfonte.
Mercur, R. E., Westmoreland Coal Co., Traymore.
Millar, E. T., B. & M. R. R., Young's.
Miller, E. A., N. Y. C. & St. L. R. R., Traymore.
Miller, E. B., B. & O. R. R., Baltimore House.
Miller, Wm., Erie R. R., Chester Inn.
Milliken, Jas., Phila. Balt. & Ohio Ry., Brighton.
Milton, J. H., Chicago Terminal C. R. I. & P., Rudolf.
Minick, Eli, Lehigh Valley R. R., 12 Michigan Ave.
Mirtz, P. P., L. S. & M. S. Ry., Traymore.
Moore, B. R., Duluth & Iron Range R. R., Traymore.
Morse, C. S., Wheeling & Lake Erie R. R., Traymore.
Munroe, J. T., Erie R. R., Chester Inn.
New, W. E., Kansas City Terminal Ry.
O'Brien, J. J., St. Louis Merchants Bridge Term. Ry., Watkins.
O'Donnell, T. J., N. Y. Car Shops, Pennhurst.
Onderdonk, J. R., B. & O. R. R., Marlborough-Blenheim.
Ord, L. C., Canadian Pacific Ry., Arlington.
Perine, D. M., Penna. R. R. (New Jersey Div.), Traymore.
Pfafflin, Louis, Indianapolis Union Ry., Biscayne.
Phillips, C., N. O. & N. E. R. R., V. S. & P. Ry., Brighton.
Pilcher, John A., Norfolk & Western Ry., Brighton.
Poole, A. J., Seaboard Air Line Ry., Marlborough-Blenheim.
Putnam, C. H., Atlanta & Birmingham & Atlantic Ry., Young's.
Rande, H. G., Newburgh & South Shore Ry., Monticello.
Rasbridge, R. B., Philada. & Reading Ry., Dennis.
Richards, C. F., Lehigh & Hudson.
Riddell, J. C., Marietta, Columbus & Cleveland R. R., Iroquois.
Rink, Geo. W., Cent. R. R. of N. J., Dennis.
Robider, W. J., Central of Georgia Ry., Chelsea.
Robins, S. P., Can. Pacific Ry., Pennhurst.
Roope, Thos., Chg. Bur. & Quincy Ry. (West), Traymore.
Ross, D. C., Mich. Central R. R., Brighton.
Rourk, W. H., Pere Marquette R. R., Lexington.
Rumney, T., Chicago, Rock Island & Pac. Ry., Brighton.
Schmidt, E. C., Univ. of Ill., Haddon Hall.
Schmoll, G. A., Balto. & Ohio R. R., Traymore.
Schrader, J. R., N. Y. C. & H. R. R. R., Young's.
Seifert S. P., Norfolk & Western.
Senger, J. W., Lake Shore & Mich. S. Ry., Lexington.
Sheafe, J. S., Illinois Central R. R., Traymore.
Sisco, G. E., Southwest System. Penna., Haddon Hall.
Smart, G. E., Can. Pac. Ry., Arlington.
Smith, P. F., Penna. Lines (Central System), Brighton.
Staley, H. F., Caro, Clinchfield & Ohio Ry., Traymore.
Stark, James L., Hocking Valley R. R., Young's.
Sternberg, Adam S., Wabash R. R., Haddon Hall.
Sullivan, J. J., L. & N. R. R., Dunlop.
Summer, Eliot, Nor. Cent. R. R., Chalfonte.
Symons, W. E., Traymore.
Tatum, John J., B. & O. R. R. Co., Chelsea.
Thomas, H. T., Detroit & Mackinac Ry., Pennhurst.
Thomas, I. B., Penna. R. R., Chalfonte.
Thomas, J. J., Jr., M. & O. R. R. and Southern Ry. in Miss., Shelburne.
Thomas, N. H., Dennis.
Thomson, Samuel G., Phila. & Reading R. R., Lennox Apt.
Tonge, John, M. & St. L., Chalfonte.
Trimyer, H. L., Seaboard Air Line Ry., Marlborough-Blenheim.
Tritsch, C. M., Western Maryland R. R., Brighton.
Van Buskirk, H. C., Colorado & Southern Ry., Chalfonte.
Vaughn, H. H., Canadian Pacific Ry. Co., Marlborough-Blenheim.
Vittum, J. E., Arlington.
Wahlen, John, Montpelier & Wells River R. R., Lexington.
Waughop, Chas., Young's.
Wilson, Jas. W., Newberry Junction, Pa., Monticello.
Wyman, R. L., Lehigh & New England R. R., Pennhurst.
Yergy, J. P., Penna. R. R. Co., Chalfonte.
Young, Chas. D., Penna. R. R., Brighton.
Young, J. P., Mo. Pacific Ry., Dunlop.
Zweibel, C. A., Atlantic Coast Line R. R., Lexington.

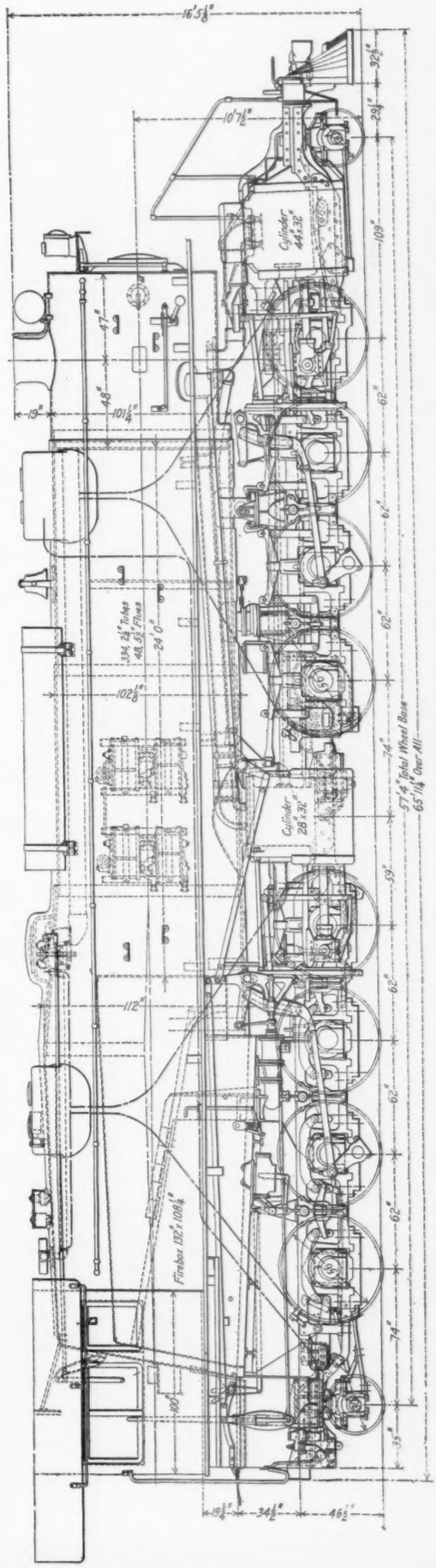
M. C. B. GUESTS.

Abbott, A. S., Frisco, Haddon Hall.
Acker, J. J., C. R. I. & P., Lexington.
Alquist, P., Pere Marquette, Lexington.
Alttvater, Chas. P., Penna. R. R., Elberon.
Arnold, A. E., N. Y. Central, Lexington.
Atkinson, C. R., Stenographer Gen. Supt. M. P., Penna R. R., Russell.
Baker, C. N., P. R. R.
Baley, W. W., N. Y. O. & W., Lexington.
Barba, C. E., P. R. R., Seaside.
Barrett, C. D., P. R. R.
Barry, Frank J., N. Y. O. & W. Ry., Lexington.
Bartram, S. L., N. Y. C., Roseda Apt.
Barwis, C. W., Penna. R. R., Princess.
Barwis, J, McC., Penna. R. R., LaBelle Inn.
Beamer, J. A., P. R. R., Chalfonte.
Berg, J. V., L. S. & M. S., Pennhurst.
Berry, A. O., Lake Erie & Western, Lexington.
Beyer, O. S. Jr., Rock Island Lines.
Beynes, Anton, J. J. Beynes Ry. Car Builders, Young's.
Blair, H. A., B. & O., Chetwoode.
Borell, Elmer A., Head Car Draftsman, Phila. & Reading Ry. Co., Albemarle.
Boring, T. J., Penna., Dennis.
Brubaker, H. H., Penna. R. R., Chalfonte.
Bunnell, F. O., Rock Island Lines, Chelsea.
Burns, R. C., P. R. R., Haddon Hall.
Busse, F. W., B. & O., Strand.
Butler, W. S., Ches. & Ohio R. R., Haddon Hall.
Byron, H. W., Penna. R. R., Chalfonte.
Cadwell, Dr. N. W., Atlantic City.
Carter, B. D., Virginian Ry., 2022 Pacific Ave.
Coates, H. T. Jr., Penna. R. R., Chalfonte.
Conlin, J., Marlborough-Blenheim.
Conner, J. F., Wash. Ter. Co.
Connors, J. M., Jr., B. & O., Chetwoode.
Cook, E. F., Union Tank Line, Chelsea.
Coulter, A. F., Union R. R., Channell.
Cromwell, E. G., B. & O., Pennhurst.
Davis, Jas. C., National Tube Co., Seaside.
Davis, W. H., N. Y. O. & W., Chalfonte.
Demarest, T. W., Penna. Lines, Brighton.
Derick, C. T., P. R. R., Iroquois.
Dildine, J. A., Penna. R. R., Dennis.
Donovan, A. G., Mgr., So. Western Mech. Co., Craig Hall.
Drawbaugh, E. L., Cumberland Valley R. R., Chalfonte.
Dyer, D. H., Norfolk & Western.
Effinger, W. P., Erie R. R., Melrose.
Egbers, J. F., Northern Pacific, Chalfonte.
Emory, J. B., M. M., Texarkana & Ft. Smith R. R., State Villa.
Ensign, J. T., Chief Insp. R. R. Dept., Interstate Commerce Co., Monticello.
Eppley, G. A., United Rwys. & Elec. Co., Isleworth.
Felton, H. E, Union Tank Line, Chelsea.
Finnegan, F. L., Chief Clerk, Ivanhoe & Carroll, Dunlop.
Fisher, W. J., Frisco, Haddon Hall.
Fitzsimmons, E. S., Erie, Chalfonte.
Fordney, Phillip, P. R. R.
Garcelou, H. I., B. & O., Chalfonte.
Gardner, G. C., Jr., Gen. Foreman of M. P., Penna., Marlborough-Blenheim.
Gilmore, W. A., B. & O., The Baltimore.
Ginder, Vivian, Soliciting Agent, Central States Dispatch, Young's.
Gray, C. B., Gen. For., P. R. R., Dennis.
Gruver, J. F., P. R. R.
Hafner, A. H., P. R. R., Seaside.
Hair, John, Special Inspector, B. & O. R. R., DeVille.
Hale, H. H., B. & O., S. W. & C., H. & D. R. R., Haddon Hall.
Hale, Ross H., B. & O., S. W. &. C., H. & D. R. R,, Haddon Hall.
Harris, C. M., Washington Terminal Co., Traymore.
Hauser, Percy, Draftsman M. E. Office, P. R. R., Young's.
Heiser, W. F., C. & E. I., Strand.
Hessenbruch, T., P. & R., Haddon Hall.
Hill, Rufus, Penna. R. R.
Hippey, E. S., P. R. R., Iroquois.
Hodges, H. A., Long Island Ry., Shelbourne.
Holzner, J. F., K. & M., Haddon Hall.
Hull, D. K., General Foreman, B. & O.
Jenny, J., For. Car Repairs, Penna. R. R., Ellwood.
Kapp, J. B., Asst. M. M., P. R. R., Chatham.
Keller, J. W., P. R. R.
Kelley, O. J., B. & O. R. R., New Berkley.
Kellogg, D. R., Haddon Hall.
Kilpatrick, J. B., Chic., R. I. & Pacific, Traymore.
Klingensmith, W. H., Foreman Blacksmith Shop, Penna. R. R., Ellwood.
Koch, Geo. B., For. Test Dept., P. R. R., Traymore.
Kraber, Luther B., P. R. R.

Kuhn, W. T., T. H. & B., Young's.
Kuier, H. G., P. R. R.
Lee, F. H., B. & O., Chetwoode.
Lide, C. D., Carolina & North West R. R.
Lindsay, Samuel M., P. R. R.
Lucord, F. M., Am. R. R. Assoc., Dennis.
Mallory, C. E., Kingan Refrigerator Line, Traymore.
May, Walter, C. C. & St. L. R. R., Chalfonte.
Maupin, J. D., Trinity Brazas Valley R. R., Lexington.
McArthur, F. A., Frisco, Haddon Hall.
McDonald, Geo., C. R. I. & P. Ry., Lexington.
Merriman, M., Ch. Clk. S. M. P., Western Maryland R. R., Brighton.
Mervine, I. B., M. P. Clerk, P. R. R., Traymore.
Mullinix, S. W., C. R. I. & P. R. R., Dennis.
Munson, Chas., C. R. & I. C., Shelburne.
Murray, John D., General Manager, Cloustmas Island R. R., Chalfonte.
Neff, W. P., Car Insp., Penna. Ry., Bothwell.
New, Fred, Kansas City Terminal.
Norris, J. C., Cumberland Valley R. R., Chalfonte.
Orr, Wm. G., P. R. R., Dunlop.
Parker, Dr. Walter E., Michigan Central, Marlbrouogh Blenheim.
Payne, H. R., Union Tank Line, Young's.
Perrine, W. M., C. of Jersey, Pennhurst.
Phillips, C. C., Brighton.
Posten, D. W., P. R. R., Iroquois.
Prentice, W. H., P. C. C. & St. L. Ry., Star Cottage.
Reilley, Thos. E., Penna. R. R. Co., Chelsea.
Renner, C. W., P. R. R., Chalfonte.
Reynolds, O. H., Pennhurst.
Rhine, Geo. B., Foreman, Penna. R. R., Biscayne.
Rice, Edmund, Chief Clerk to Pur. Agent, Boston & Albany, Shelburne.
Rickard, E. S., Dist. Car Inspector, Rock Island, The Tracy.
Robb, J. W., Cudahy Packing Co., Dennis.
Robinson, G. P., U. S. Assistant Ch. Insp., Loco. Boilers, Absecon.
Rowland, E. T., P. R. R.
Sagsletter, W. H., M. M., Kansas City, Southern, Shelburne.
Schuyler, A. J., Virginian Ry.
Sheen, John, A. & W. P. & W., Lexington.
Sindall, G. E. M., P. R. R., Westminster.
Singleton, C. W., Penna. R. R., Radnor.
Smith, A. E., Union Tank Line, Chelsea.
Smith, E. W., P. R. R., The Princess.
Smith, J. A. B., U. S. Navy, 106 N. Vermont Ave.
Stanton, E., Norfolk & Portsmouth Belt Line, 2022 Pacific Ave.
Stewart, A. F., Traymore.
Stoll, W. J., L. S. & M. S., Pennhurst.
Strattan, R. T., P. R. R., Seaside.
Sweeley, E. H., Long Island, Shelburne.
Taylor, F. C., West Jersey & Seashore R. R., Bothwell.
Thomas, W. H., Dennis.
Trace, A. A., Chief M. C. B. Clerk, Erie R. R., Colwyn.
VanBlarcum, C. B., B. & O., Eberon.
Van Blunt, Geo. E., Penna. R. R., Iroquois.
Vaught, Harry D., Marlborough-Blenheim.
Walker, Tuttle C., Evening Union, Penna. & Bdwk.
Walsh, Charles E., West. Ch. Clerk, Pur. Agt., Penna Lines, Haddon Hall.
Warnoch, H. R., Monongahela R. R., Francis.
Wilt, W. L., Penna. Co., Dennis.

MOST POWERFUL LOCOMOTIVE IN THE WORLD.

A locomotive with a firebox large enough to easily admit a 6 in. x 10 in. four wheeled tank locomotive, as is shown in the accompanying illustration is impressive even in these days of record breaking machines of all kinds. The boiler shown is one of four built by the American Locomotive Company and applied to Mallet locomotives of the 2-8-8-2 type for the Virginian Railway. This boiler measures 100 in. in diameter at the front end and 112 in. at the connection with the firebox. The area of the firebox inside of the sheets at the mud ring is 108 in. x 173 in. This however is not all grate area as the Gaines type of combustion chamber has been applied. The firebox including the combustion chamber, has a total heating surface of 410 sq. ft. The tubes are 24 ft. long and give a heating surface of 6,350 sq. ft., making a total evaporative surface of 6,760 sq.



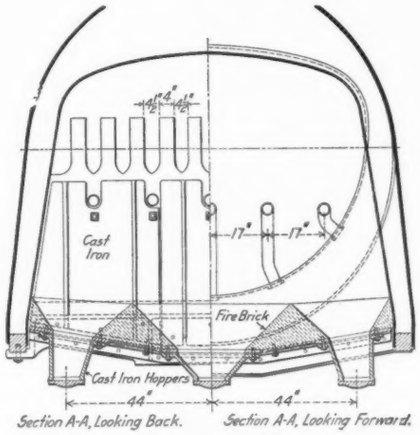
Most Powerful Locomotive in the World; Designed for Pusher Service on the Virginian; Maximum Tractive Effort, Compound, 115,000 Lbs.; Simple, 138,000 Lbs.

ft., or more than any other locomotive ever built. When it is further considered that a Schmidt superheater has 1,310 sq. ft., the comparative size of the boiler can be fully appreciated. The actual grate area is 99 sq. ft.

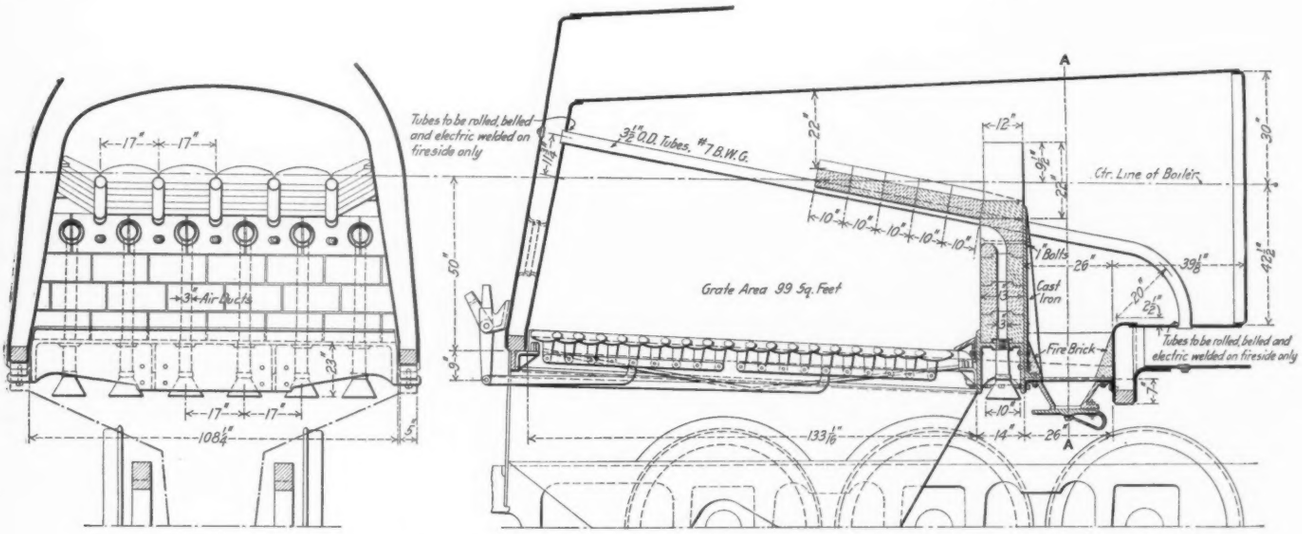
The boiler is not the only impressive feature of this locomotive. As will be seen by reference to the general elevation, the height from the rail to the top of the stack is 16 ft. 5½ in., the low pressure cylinders are 44 in. in diameter and the maximum width over cylinders is 144 in., all of which are larger than the measurements of the same points on any other locomotive.

These locomotives have been built for pusher service on a 2.07 per cent. grade between Elmore and Clarks Gap, West Virginia, a distance of 14 miles. Two of them as pushers with one of the older Mallets leading, are expected to allow an increase in train tonnage from 3,340 to 4,230 tons. The former tonnage is now obtained by using a Mallet road engine with two larger Mallets pushing and is the maximum that can be taken over this grade. The remainder of the division is such that a tonnage of 4,230 tons can be carried by the older type of Mallet road engines.

tions. This is a combination of a Gaines fire brick wall with a Security brick arch supported by tubes which curve and



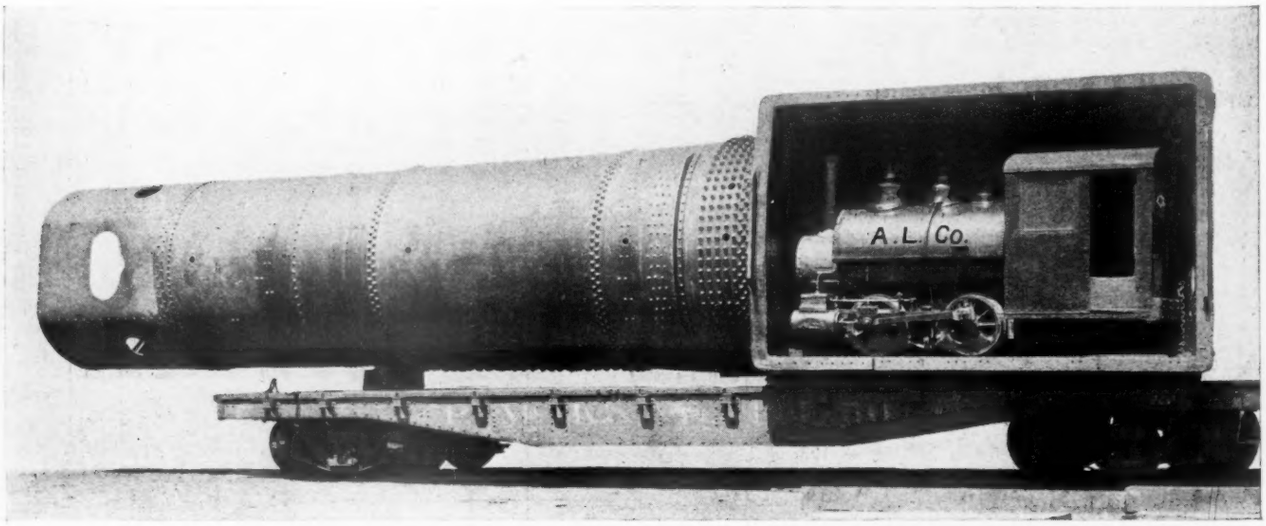
Section of Firebox Showing Mixing Fingers on Top of Fire Brick Wall.


Tubes to be rolled, belled and electric welded on fireside only
3½" O.D. Tubes, No. 7 B.W.G.
Ctr. Line of Boiler
Grate Area 99 Sq. Feet
Cast Iron
Fire Brick
Tubes to be rolled, belled and electric welded on fireside only
3¼" Air Ducts
108⅝"
133 1/16"

Firebox of Virginian Mallets Showing Combination of Gaines Fire Brick Wall with a Security Brick Arch.

In addition to the size of the locomotives, the point of the greatest interest is probably found in the firebox arrangement which is clearly shown in one of the illustra-

enter the bottom of the combustion chamber. Mixing fingers are formed as an extension of the top of the fire brick wall and form a further aid to combustion beside tending



Largest Locomotive Boiler; Built by the American Locomotive Company for the Virginian Railway.

to force the flame up against the crown sheet at this point.

Vanadium steel has been extensively used for those parts subjected to the greatest strain. This includes frames, crossheads, tires, springs, main driving axles, main crank pins and piston spiders. The cylinders and valve chamber bushings are constructed of Vanadium cast iron. Some of the more important dimensions are given in the following table:—

Tractive effort, compound	115,000 lbs.
Tractive effort, simple	138,000 lbs.
Weight in working order (estimated)	540,000 lbs.
Weight on drivers (estimated)	479,200 lbs.
Diameter of driving wheels	56 in.
Steam pressure	200 lbs.
Tubes, number and outside diameter	334—2¼ in.
Flues, number and outside diameter	48—5½ in.
Tender, water capacity	12,000 gal.
Tender, coal capacity	15 ton.

FOREIGN RAILWAY NOTES.

The Peking-Hankow Railway, the northern section of the great trunk line north and south through China, in which American interests were once involved and which represents the most important railway element in the country, has been in operation for about five years. All authorities seem to agree that, though it reports a profit of about $1,680,000 per year, it is deteriorating very rapidly in physical upkeep. The Chinese railway authorities claim that this deterioration is due largely to the fact that the foreign interests which formerly owned it knew it was to be transferred to the Chinese and neglected it, with the result that now its upkeep is more difficult and expensive than it should be. The railway's accounts do not show a proper allowance for deterioration, and the showing of a profit is more or less a matter of unscientific bookkeeping, the impairment of the railway plant resulting, in fact, in dividends being paid from the railway's capital. The general opinion is that a financial reorganization will be necessary to put the railway upon a safe and satisfactory basis. That this reorganization is coming seems beyond doubt and is only a matter of time. It is almost certain to lead to very important developments in the reorganization of railways in this portion of China generally, and will have a marked influence upon the course of Chinese railroading for years to come.

A notable feature of the railway situation in China is the comparatively rapid development of the desire for railways tributary to the lines already constructed; that is, an appreciation of the need, in the development of local industries, of close and convenient connections with the trunk systems. This is particularly noticeable along the coast above the Yangtze river, where a number of Chinese cities have shown a desire to secure connections with the Pukow railway and the Peking-Hankow railway, and between these railways and the Grand Canal. Several cities, notably Chinkiang, are commencing to appreciate the fact that they must have railway connections at once or their present position in the trade of the country will be lost. Local industries, like the salt industry in Kiangsu province and various mines in portions of the country to the north, are demanding and are gradually securing railway facilities. A number of these small lines are projected for connecting the existing lines and for serving them with many branches and connections. Among the new enterprises are the projected lines to connect the Tientsin-Pukow system with the Grand Canal, and cross lines at the Shangtung-Kiangsu border from Lintscheng to Taierchuang to take the place of the projected Hantschuan-Ihsien line; the Kaomi-Ichow line to connect the German neutral territory with southern Shantung; and the Kaifong-Haichow line, furnishing an outlet at the seaboard for the east and west line through Honan and projected all the way to the Russian border.

Conventionalities.

Someone has suggested that "interstatecommercecommissionized" should be Fletcherized.

Lost—One Bureau of Information. Finder will please return to the president of the Railway Supply Manufacturers' Association.

D. F. Crawford, general superintendent motive power of the Pennsylvania Lines West, had to leave Atlantic City Tuesday morning for an inspection trip. He expects to return on Sunday.

F. W. Brazier, superintendent of rolling stock of the New York Central & Hudson River, has just returned from an inspection trip over the system. He was one of the first to arrive Tuesday.

Robert P. Lamont, president of the American Steel Foundries, registered at the Marlborough-Blenheim, Wednesday morning, and attended the opening exercises of the M. C. B. convention.

Joseph Bromley and A. F. Duffey, inspectors of the Interstate Commerce Commission, are in attendance at the convention and have spent considerable time in looking over the exhibits.

M. K. Barnum, general superintendent of motor power of the Illinois Central, expects a record of 60 heavy repairs to locomotives on the system this month. He came down on the special from Chicago Tuesday.

Postlethwaite hadn't been on the pier five minutes before he got into a dispute, the reason for which was not clear to onlookers. It is suspected that Wilkinson, who stood close by, was in some way concerned.

The work assigned to the Bureau of Information has been turned over to the Enrollment Committee. Those who seek information concerning convention affairs will be accommodated at the office of the enrollment committee.

Edward B. Leigh, president, and Arthur Wyman, assistant to the president of the Chicago Railway Equipment Company, lost no time after their arrival Tuesday afternoon on the Pennsylvania special in greeting those already on the ground.

H. M. Estabrook was elected president of the Barney & Smith Car Company last week, in place of A. M. Kittridge, who resigned on April 17. Mr. Estabrook entered the employ of the company as a clerk, less than 27 years ago.

Harry U. Morton, vice president of the General Railway Supply Company, and Harry H. Schroyer, president of the Acme Supply Company, arrived from Chicago via New York on Tuesday. They will make the Strand their headquarters.

At the time of going to press A. J. Stevens, who was last week elected vice-president and general manager of the Barney & Smith Car Company, was expected to reach Atlantic City this morning. He will stop at the Marlborough-Blenheim.

Mrs. W. H. Coyle, wife of the assistant to the vice-president of the Franklin Railway Supply Company, spent Saturday and Sunday at Atlantic City, returning to New York on Monday. She will return at the end of the week and remain during the Master Mechanics' Convention.

Mr. and Mrs. Albert C. Ashton and Mother Ashton are staying at the Marlborough-Blenheim. This is the first time in five years that these two members of Mr. Ashton's family have been here with him. Mother Ashton has been coming to these conventions on and off for the last 33 years.

T. Dunbar had a bag of pretzels thrown in his lap on the Boardwalk by some mysterious person on which was the

message, "Feed these to the chickens." Being at a loss as to what particular breed relishes that kind of food, he desires to consult with some of the Boardwalk fanciers present.

R. B. Kendig, general mechanical engineer of the New York Central & Hudson River, was a little late in reaching Atlantic City because of the arrival of a 10 lb. boy about a week ago. This is No. 5, and the second boy. The youngster is said to resemble his mother.

Odds on Saturday's ball game have been sidetracked by the betting on a game of golf scheduled for Friday. E. H. Bankard and D. F. Mallory are to play J. L. Replogle and E. H. Bankard, Jr. The odds favor Bankard, Sr., and Mallory; but, judging from certain "inside information," somebody's going to get fooled.

D. F. Crawford, general superintendent of motive power of the Pennsylvania Lines West of Pittsburgh, arrived Tuesday He is enthusiastic about the results which are being obtained from the use of the mechanical stoker on his road, 75 of which are now in service. In a recent test one of these stokers on a Pacific type locomotive fired 9400 lbs. of coal an hour for two consecutive hours.

As M. H. Haig has not yet arrived, anyone wishing to investigate the subject of flange lubrication is referred to R. D. Smith, superintendent of motive power of the Boston & Albany. He applied a lubricator to a passenger locomotive and discovered that thereafter it refused the services of a pusher provided to help the train up one of the bad grades in the Berkshires.

Friends of W. E. Dunham, supervisor of motive power and machinery of the Chicago & North Western at Winona, Minn., had some difficulty in recognizing him Tuesday until he invested in a new hat. A distinct gain in weight, coupled with the soft felt hat, changed his appearance entirely. Apparently, life in the Northwest is agreeing with him. He is quite enthusiastic over the application of superheaters to switch engines.

George Wildin, mechanical superintendent of the New Haven, is booming the baseball game for Saturday. After trying hard to locate Hammond, the captain of the Western team, he remarked: "It will be just as well for all of them if they stay away; for we are going to give them an awful licking." His friends are thinking of presenting him with a all-steel bat; but even this may meet the same fate as the hickory one last year.

F. H. Stark, superintendent of the Montour Railroad and the Pittsburgh & Moon Run, says that it is extremely hard to get common labor in the Pittsburgh district because of the activity of the mills and manufacturing industries and the extensive public improvements which are being made. A great many foreigners, believing that business conditions would remain quiet this year, returned to their native lands, and this has aggravated the condition.

J. J. Hennessey, master car builder of the Chicago, Milwaukee & St. Paul, gave convincing proof of his Irish descent in the convention hall yesterday. The following is taken from the stenographic minutes: "I notice that the mayor of the city said he was not a handsome man—I agree with him. (Laughter and applause.) But I overheard a little conversation last night on the Boardwalk that flattered me very much. Two gentlemen were walking along the Boardwalk, both practically as white-headed as I am, and certainly their judgment must be good. One said to the other: 'There is a certain lady here who is the most handsome woman that has ever attended the Master Car Builders' Convention.' The other man looked at his friend and said: 'Sir, if she is the one handsomest lady that ever attended the Master Car Builders' Convention, she is the handsomest lady in the world.'" (Applause and laughter.)

The Exhibit.

The Gold Car Heating & Lighting Company, New York, has brought out a thermostatic temperature regulator for heating railway cars. This regulator automatically controls the steam admitted to radiating pipes by the temperature of car.

Through the courtesy of the Jacobs-Shupert U. S. Firebox Company, New York, the Twentieth Century coupler is being exhibited in space 180-182. This coupler, which has just been developed and has not yet been placed on the market, is of the side operating type, consists of only three pieces and is said to be foolproof. It is in charge of W. A. Palmer, formerly with the Queen & Crescent.

Arthur Haller, of the American Locomotive Company, New York, arrived on the pier Tuesday morning very much out of breath, owing to his exertions in carrying a photograph of the boiler for the Virginian Mallet, the largest locomotive boiler ever built. It measures 112 in. in diam., and is equipped with a combination of the Gaines combustion chamber and Security brick arch. This photograph will be on exhibition during the convention.

GAS-ELECTRIC MOTOR CAR.

Gas-electric cars are now in successful operation on a number of railways in this country, being especially efficient on rapid transit interurban lines. Branch lines are sometimes operated at a loss by steam due to the small amount of travel, and this same traffic condition usually does not warrant the initial expense of complete electrification. In this province, the gas-electric car is proving its ability to reduce operating expenses. The gas-electric car is essentially a locomotive and car combined in one unit. In developing these cars, the General Electric Company, Shenectady, N. Y., has effected many improvements that contribute to simplicity, ease of control and resultant safety in operation. The motive power centers in the engine, generator and the motors. Several standard styles of car bodies have been established to meet the various requirements and a wide range of types can be furnished in response to demands for special arrangements of seating, smoking, mail and baggage compartments. But one motorman and one conductor are required to operate the car.

They are of all-steel constructon, with the exception of the interior finish. The frame consists of steel I-beams and channels, strongly cross-braced, and steel plates form the outside sheathing. The underfloor of the car is of wood, sheathed with sheet iron on the lower side; while between this and the floor proper a heavy felt lining is inserted; the car sides are also interlined with felt. Cars having center entrances are built with the turtle back design of steel roof and rear; they may be provided with an observation platform and rear entrance, or both rear and center entrances. In general, the interior trim is of mahogany and the ceiling is sheathed with composite board. The windows are fitted with plate glass; the seats are made long enough to accommodate three persons; they are covered with friezette plush in the passenger compartment and with genuine Spanish leather in the smoking room, and the entire car is lighted with attractive electric incandescent fixtures.

The generating unit is located above the floor line of the cab, free from dust and dirt and under immediate observation of the engineer. It consists of an 8-cylinder, 4-cycle gas engine of the V type, direct connected to a 600-volt, commutating pole electric generator, designed to meet the special conditions the service demands. The engine is started by

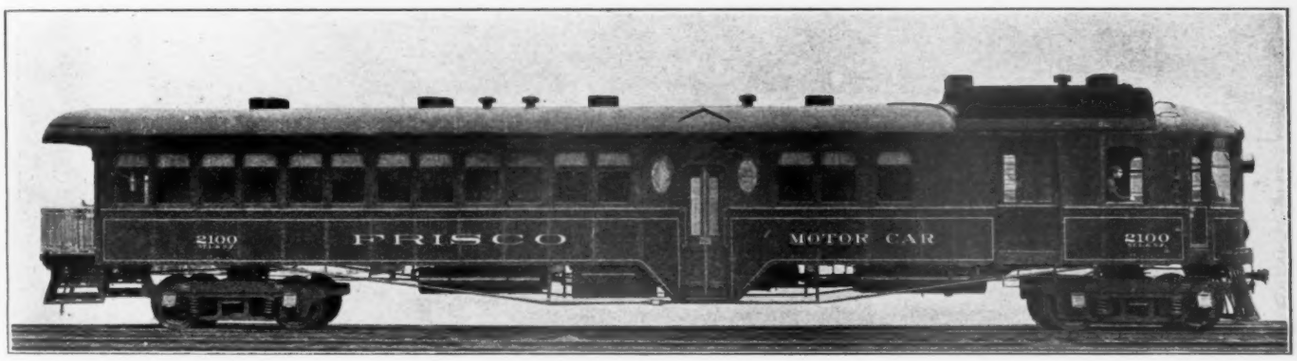
compressed air taken from the main reservoirs of the air brake system which are built with surplus capacity for this purpose. The main air compressor is driven from the crank shaft of the main engine, and is fitted with an automatic governor which maintains a constant pressure. The engine can rotate at normal speed, irrespective of the speed of the car. An auxiliary equipment is also provided, consisting of a 2-cylinder 4-cycle gas engine direct connected to a single cylinder air compressor and lighting generator. The function of this set is to supply an initial charge of air for starting the main engine and to deliver power for lighting the car. This set is started by hand.

The control is simple, substantial and similar to that of any standard electric trolley car. Mounted on the axles of the forward truck are two GE-205, 600-volt, box frame, oil-lubricated commutating pole railway motors of 100 h. p. each. The voltage is governed by varying the strength of the generator field, which is accomplished by the movement of a single handle on the controller, and the resultant speed changes of the motors produce a smooth and rapid acceleration without rheostatic power losses or gear changes. Separate handles are provided for throttling the engine and for reversing the car.

NEW IGNITER FOR MOTOR CARS.

A novel ignition system, which requires no batteries or magneto, has recently been adopted by Fairbanks, Morse & Company for use on section motor cars. The igniter for each cylinder is made up of two permanent magnets each passing through a wire coil. These are located parallel to each other and a bar armature, held in place across the ends by a strong spring, makes them a horseshoe magnet. At the opposite end is another cross bar which makes but instantaneous contact. By means of an eccentric on the crank shaft, which operates a trip latch on the igniter, the first armature is displaced from its seat on the magnet at the same instant that the second makes its contact. This reverses the flow of current through the magnet until the first armature is reseated by the spring. As it strikes its permanent seat a spark is produced between the points of the spark plug.

The igniter is enclosed in a dust and water proof case, and requires only as many wires as there are cylinders on the engines, a secondary wire running from each spark plug to its igniter. The simplicity of this ignition is apparent.



Gas-Electric Motor Car for the 'Frisco.

The latter is accomplished instantly by changing the motor connections in the usual manner, without stopping the engine, which always rotates in the same direction. This allows the cars to be stopped quickly independent of the brakes in an emergency. All the levers are located within convenient reach of the operator. The radiators are placed on the roof and the circulation for cooling the engine is maintained by the thermo-siphon system.

The trucks are of the swing bolster type with elliptic bolster springs and coil equalizer springs. The bearings, treads and flanges of the wheels and axles conform to the standards of the M. C. B. Association. The brake equipment includes hand brakes in addition to the combined straight and automatic air brakes. The headlight consists of a 50 candlepower Mazda incandescent lamp and reflector. A hot water heater, coal fired, is installed for heating the car. To prevent freezing in cold weather when the car is lying idle, the heater circulation may be connected to the engine cooling system. A 150 gallon gasolene tank for the power supply is suspended under the car. While the car is running the gasolene is pumped automatically by the engine, and by a hand pump when idle. The car illustrated is in service on the Frisco system, over whose lines a total of seventeen of these seventy-foot gas-electric cars will soon be in operation. Among other roads using these cars are the Southern Railway; Minneapolis, St. Paul, Rochester & Dubuque; Bangor & Aroostock; Buffalo, Rochester & Pittsburgh; Canadian Northern; New York, Westchester & Boston; Delaware & Hudson; Missouri Pacific; Pittsburgh & Lake Erie; Missouri & Northern; Arkansas, and the Chicago, Rock Island & Pacific.

The spark coil, batteries and commutator are all eliminated, together with all complications in wiring.

An exhibit of this ignition system can be inspected at the Fairbanks-Morse space, No. 584, where a complete sectionalized motor car is exhibited. This shows the engine in operation and how the spark is obtained in the engine cylinders with the new igniter.

PENN FREIGHT COUPLER.

The Penn freight coupler exhibited by The McConway & Torley Co., spaces 501, 503, 505, is adapted for both overhead and underneath release. No change in the detail parts

Penn Freight Coupler with Underneath Release.

of the coupler is required to make the change from the overhead release to the underneath release; the lifter of the locking block is simply reversed from the upper side of the coupler and inserted from the lower side. When used as an

overhead release the lifter pulls the lock up by the operation of the overhead lever, and when applied underneath, it pushes the lock up by the operation of the underneath release lever. In addition to this feature, the coupler has 5

Penn Freight Coupler with Overhead Release.

sq. in. of bearing surface between the lock and the knuckle, which is more than one square inch in excess of the M. C. B. recommended practice.

The coupler also has a lock-set, and an efficient knuckle

For Overhead Release.

For Underneath Release.

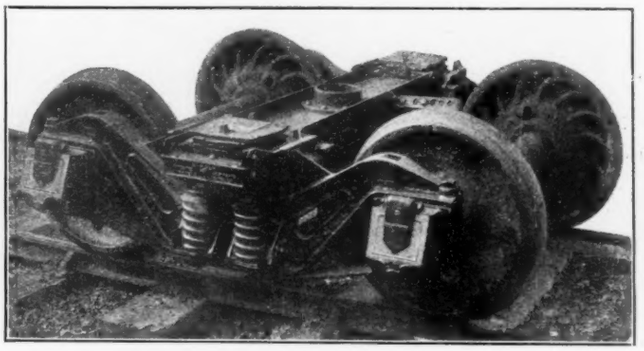
opener, which pushes the knuckle open to its fullest range of movement from either a fully closed position or from any partially closed position.

BARBER 50-TON STEEL FLAT CAR.

The Standard Car Truck Company, Chicago, has a new type of flat car in the track exhibit, which was designed and thoroughly tested out in service by the mechanical department on one of the large trunk lines. The car is designed for 100,000 lbs. capacity and carries the load on two main steel girder sills of a special form. These are spaced apart with center lines directly over the center lines of the truck side frames, which are above the center lines of the journals.

The radial and lateral travel of the truck is provided for in the well-known Barber anti-friction truck devices, which are applied between the underside of the main body girders and the top of the truck springs, and all of which rest and are supported centrally in the steel truck side frames. All details are carefully designed to meet railway requirements in case of repairs or renewal of parts.

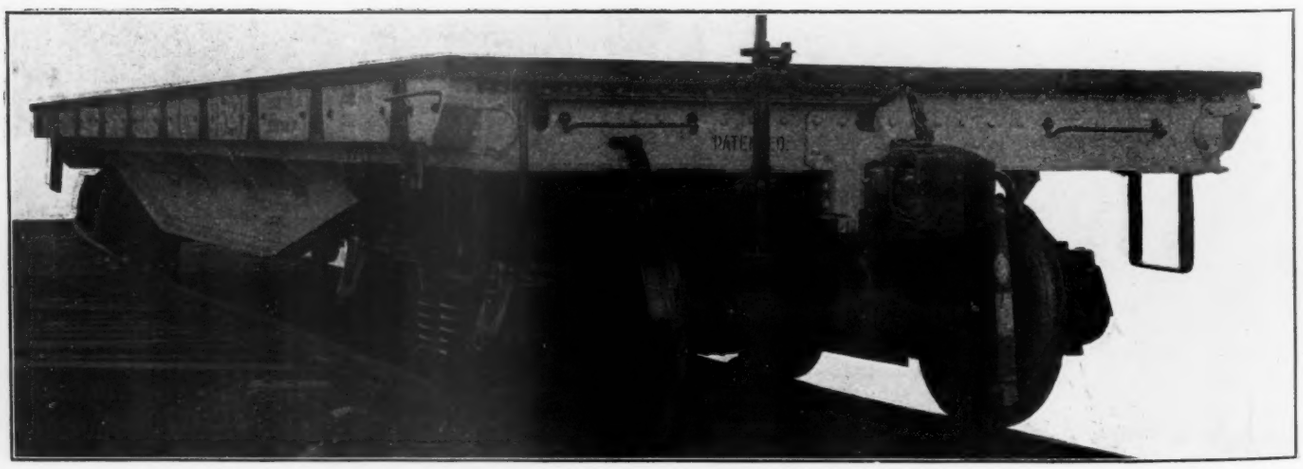
The load instead of being carried on two center plates, now the common practice, is carried on four steel bearings applied to the outer ends of the truck bolsters. The present center plates are entirely eliminated in the construction, the load being transferred directly in and over the truck frames which provide solid construction with free radial and lateral travel of



Barber Side Bearing Truck.

the bolster, sufficient to lessen the blows and wear between the wheel flange and the rail. This construction removes the load from the center of the truck and body bolster to the truck side frames direct and increases the freedom for curving the truck fully 40 per cent., as compared with the present common standard center plates.

The truck side frames are of I-beam drop girder shape, preferably of cast steel. The truck springs are spaced in pairs, each side supported on a seat cast solid with the truck frames. The truck bolsters are rolled or cast steel I-beam shaped with the web of the beam placed horizontal. The center pivot in place of the center plate provides for and takes care of the buffing shocks. There is no vertical load on this center pivot. The roller caps are of malleable iron and are secured to the under side of the bolster. The radial roller seats of cast steel are secured on the upper side of the bolster.



Barber 50-Ton Steel Flat Car with Side Bearing Truck.

The radial roller cap is also of steel. The three parts of the radial device are so arranged that they are interlocked into one member with freedom to move with the curving of the truck or car body.

The company has had several cars and trucks of a similar design in the roughest kind of service for from two to four years, some of which have made 50,000 miles and are still running with the original wheels, journal bearings and other parts, and without expense for repairs. The car and truck are designed to provide minimum weight and cost of maintenance and to reduce wheel flange wear and train resistance.

WALKER & BENNETT SIMPLIFIED CAR SEATS.

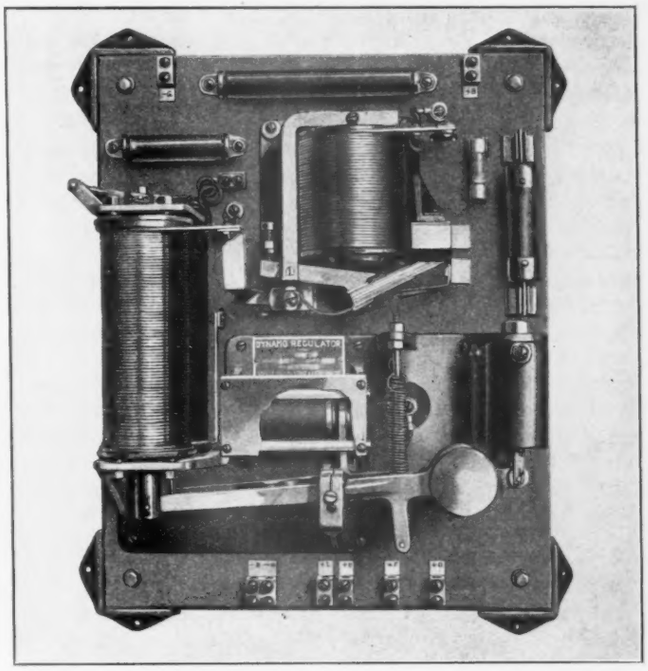
The Walker & Bennett Simplified car seats, made and shown by the United States Metal Products Company, New York, embrace many new ideas in car seat construction, including pressed steel pedestals, arm rests of several new designs, end plates, etc. The pedestals and the arm-rests, are so constructed that they are apparently in one piece, joined in such manner that the seams cannot be seen, and presenting a smooth surface. The construction of these pieces is such that minimum weight is obtained with maximum strength. The new fastening of the seat to the pedestal is strong and simple, and made possible by the use of the original Walker & Bennett round tubular connecting rods. The arm-rests and aisle end-plates are made intact and consequently the arm-rests are secure. The finish of the arm-rests is in imitation of mahogany.

SAFETY TYPE F REGULATOR.

The method of controlling an axle lighting dynamo by means of a carbon resistance in series with the field circuit was first introduced by the Safety Car Heating & Lighting Company, New York, and has been demonstrated to be the only method of control which will fulfill the exacting conditions of car lighting service. The Safety type D regulator has proved its efficiency in actual service and has successfully met all the requirements. In the endeavor to perfect the type D regulator the type F regulator has been developed. The operation is essentially the same as the type D; that is, the generator is completely protected against overload, batteries can never be overcharged, and at the same time, when the batteries are empty, they can be charged in the minimum length of time. This result is accomplished with two pieces of apparatus on the regulator instead of three as on the type D.

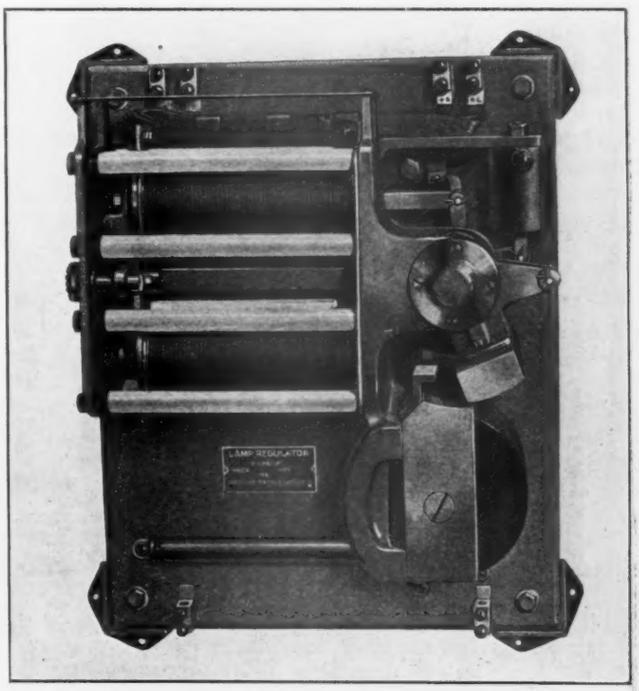
The control of lamp voltage has been the most difficult feature in connection with axle light equipments and experience has shown that a carbon pile resistance in series with the lamps is the only satisfactory method for accomplishing accurate regulation. In order to emphasize the importance of accurate lamp regulation, it should be noted that if the voltage delivered to an electric lamp drops 3 per cent. below normal, the available candle power of the lamp drops 10 per cent.; if the voltage drops 5 per cent., the candle power drops 18 per cent. If the voltage on the lamps is 3 per cent. above normal, the life of the lamp is reduced 33 per cent., and if the voltage is 5 per cent. above normal, the life is reduced 50 per cent. It has been the aim in the design of lamp regulators to accomplish the closest possible lamp regulation with the fewest number of parts. The type D lamp regulator has demonstrated in service that it is possible to satisfactorily regulate the lamp voltage by using a carbon pile resistance in series with the lamps, an electro magnet regulating the pressure upon this carbon pile and a control apparatus controlling the strength of the electro magnet and causing it to respond to variations in lamp voltage. The type F lamp regulator is a perfected type D, the same regulation being accomplished without a means of control exterior to the lamp regulator proper. The actuating magnet is connected directly across the lamps; the regulator is so carefully designed and built that it will respond to the smallest variations in lamp voltage.

Type F Dynamo Regulator.—The dynamo regulator consists



Safety Company Type F Dynamo Regulator.

of two pieces of apparatus, the field regulator and the main switch. The main switch is of the closed magnetic circuit form with a hinged armature carrying a heavy laminated copper contact, the whole being of the design that is universally used in circuit breakers and other switch apparatus. The field



Safety Company Type F Lamp Regulator.

regulator consists of two coils, a series coil carrying the total generator output, and a voltage coil, connected directly across the generator, and subject at all times to generator voltage. The plungers of these two coils, acting through independent

levers, vary the pressure on the field resistance carbons, giving the proper field current strength to regulate the generator output for all conditions of speed and battery charge. The voltage coil prevents the voltage impressed on the battery rising above 40 volts and the series coil prevents the total current given out by the generator rising above its desired output.

Experience has demonstrated that if a lead battery has impressed across its terminals the voltage of 2.5 per cell, it will automatically take a charge best suited to its needs; that is, the charge will start at a high rate and will automatically taper to nerly zero as the battery becomes full, corresponding to a stop charge. If the battery is entirely empty and, more particularly, if there is a considerable lighting load, the current demand upon the generator will be in excess of its safe capacity; therefore, it is necessary to prevent the generator being overloaded under any conditions. With the type F regulator the generator gives its full rated capacity at all times, if it can be used, charges the battery in the shortest possible time, and protects the battery from overcharge.

Type F Lamp Regulator.—The type F lamp regulator consists of two carbon pile resistances connected in series with the lamps. The carbons are compressed by a coil spring, which is connected by a link, acting through a toggle mechanism to the armature of the actuating magnet. The pull of the spring is opposed by the pull of the electro magnet. The coil of this magnet is connected directly across the lamp mains. The pull of the spring is adjusted so that it will balance the pull of the magnet throughout its stroke when the lamp voltage is of the desired value. Mechanical friction and hysteresis are eliminated by careful design and the use of the proper materials.

If the lamp voltage is increased, the pull of the electro magnet is increased and the pressure upon the carbons is reduced; their resistance is thereby increased until the lamp voltage is again normal. If the lamp voltage is reduced, the opposite action takes place, the magnet being weakened and the carbons more tightly compressed, reducing their resistance and bringing the lamp voltage back to normal.

The type F lamp regulator is a simple piece of apparatus and, consisting as it does of only a carbon pile in series with the lamps and a magnet connected across the lamp, there is nothing to get out of order. The operation is simple and most reliable, because the voltage regulation depends only upon the balance between a magnet pull and a spring pull, without the use of any control apparatus such as carbon pile controls, buzzers or vibrators.

COMBINATION STEEL UNDERFRAME AND TRUCK BOLSTER FOR FREIGHT CAR.

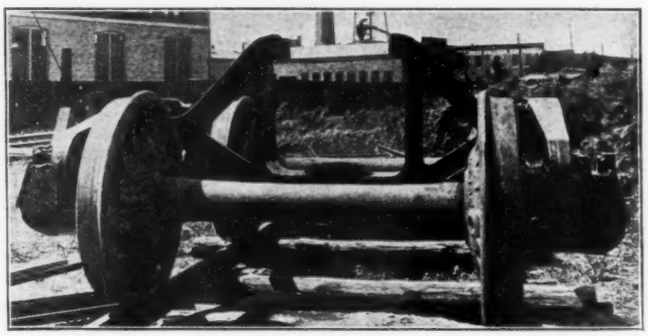
The Mid-Western Car Supply Company, Chicago, has in the track exhibit a sample car illustrating a novel design for steel freight cars. The combination body and truck bolster presents an important improvement in the design of the steel underframe. This design as applied to the steel underframe freight equipment results in a saving in weight. The reduced first cost and that of maintenance are also important advantages over present designs.

The combination body and truck bolster has only two parts, the body proper and the pivot cap. These are of cast steel and the truck center plate is cast integral with the bolster body. The illustration shows this bolster with the cap removed. The center sill may be the single I-beam type or it can be made of channels, which have the cast steel body center plate extending between and securely riveted to them. The center plate sill spreaders have pivot pin extensions about 5 in. outside diameter, centrally located at top and bottom and engaging the pivot cap on top, and a cored hole in the center of the bolster bearing at the bottom. The centers of the pivot pins are connected by a cored passage and the hole is filled with oil and waste to provide lubrication for the center bearing. The underframe of the car to which the combination bolsters are applied has four cross ties, which, in addition to end sills and cross bearers, transmit the load to the center bearing. Normally the load of the car will rest centrally on the center bearings, but when the car is rounding on curves at speed, the centrifugal force will throw the center of gravity to one side and the pivot pins will then take the side force and perform the same office as the side bearings on ordinary equipment.

On a curve the car proper is guided laterally by the pivot pins and swings on center bearings, independent of the truck and bolster. In removing the truck from the car body it is only necessary to unscrew the bolts that secure the pivot cap to the bolster, jack up the car, and proceed in the usual manner.

The advantages claimed for the combination bolsters are: Increased strength. The design of the underframe is such that all the members can be made proportional to the known forces to which the car is subjected in service. The elimination of a large number of details simplifies the design and thereby makes it possible to accurately trace the forces and determine the exact amount of metal needed for a given load.

A steel underframe having the combination bolster will weigh considerably less than the average ordinary steel underframe, the strength in each case being the same. Not only is the weight of two bolsters eliminated, but a large number of pieces



Combination Steel Underframe and Bolster with Center Pivot Cap Removed.

and members necessary in the ordinary underframe are done away with.

The first cost of the underframe having the combination bolster will be much lower than the ordinary underframe, and maintenance cost will be reduced to a minimum.

Side bearing friction will be eliminated. This is a large factor as it is estimated from dynamometer tests that a total of about 2 per cent. of the pulling force from the locomotive is lost in side bearing friction. There is also a loss of power, due to the effort to overcome the added resistance caused by flange friction.

The inside height of box cars is increased. The floor line of the car can be located some 12 in. lower on cars having the combination bolster and the standard drawbar height may be retained. This increases the cubic capacity and, therefore, the loading capacity of many kinds of merchandise cars which are now restricted as to inside height by tunnel clearance and height of trucks.

The point of application of the load of cars having combination bolsters is only 19 in. above the top of the rail, which is much lower than in ordinary cars. The possibility of derailment is reduced, and this is an important factor in high capacity cars, especially in fast freight service.

The car is equipped with the Anderson friction draft gear, type A, having the double yoke attachment, which carries the gear, eliminating the draft bolts, nuts and straps. The Mid-Western Car Supply Company's buffing device located within the buffer or striking plate casting is used, and works in unison with the draft gear.

Railway Age Gazette

DAILY EDITION

Copyright, 1912, by the Simmons-Boardman Publishing Co.

Vol. 52. NEW YORK—JUNE 14, 1912—ATLANTIC CITY. No. 24a.

PUBLISHED EVERY FRIDAY AND DAILY EIGHT TIMES IN JUNE, BY SIMMONS-BOARDMAN PUBLISHING CO., 83 FULTON ST., NEW YORK.

CHICAGO: 417 South Dearborn St. CLEVELAND: Citizens Bldg.
LONDON: Queen Anne's Chambers, Westminster.

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Subscriptions, including 52 regular weekly issues and special daily editions published from time to time in New York, or in places other than New York, payable in advance and postage free:

United States and Mexico	$5.00
Canada	6.00
Foreign Countries (excepting daily editions)	8.00
Single Copies	15 cents each

Engineering and Maintenance of Way Edition and the four Maintenance of Way Convention Daily issues, North America, $1.00; foreign, $2.00.

Entered at the Post Office at New York, N. Y., as mail matter of the second class.

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THE EXHIBIT 1395

A PROBLEM will be presented to the executive committee of the Master Car Builders' Association if the attendance and the interest in the meetings continue to increase as they have during the past two years. Although the seats are filled in the meeting hall, there are not even now sufficient chairs for those attending. While there would be a number of objections to such a move, it may be necessary to hold at least part of the meetings next year in the Hippodrome, on the second floor of the exhibition hall.

THE rank and file of the Master Car Builders' Association are chiefly responsible for seeing that the standards of the association do not become obsolete and useless. The committee on revision cannot be expected to personally discover every phase of changing conditions that may make an alteration in some standard or recommended practice advisable. It is up to the members individually to draw attention, either by letter to the committee or on the floor of the convention, to anything bearing on the subject of standards that may come to their notice.

AN inspection of the exhibits in machinery hall gives evidence of an increased appreciation by machine tool builders in general of the demands of the users for safety appliances. In practically all cases, the tools exhibited have all the exposed gearing carefully covered; belts are inclosed and there are no exposed bolt heads or pins on moving parts, and in one case at least, push buttons for stopping the motor are provided within convenient reach of the operator. That the builders have so quickly caught the spirit of the move toward greater safety in the shops, now so vigorous throughout the whole country, is but another proof of the desire of the fraternity to coöperate with the users, not only in securing the output desired but in every other reasonable suggestion even though it may add considerably to the cost of their product.

THE use of car unloaders for ore and coal has been confined largely to the docks on the great lakes and the Atlantic coast, but the economic handling of heavy low grade materials has suggested their use for cars loaded with stone and cement and this extension of the territory where car unloaders are used, will cause a more general interest among M. C. B. members as the means for preventing damage to cars by these devices. The committee is making good progress in designing protective blocking for this purpose, but continued coöperation is necessary to keep this damage under control and provide for changing conditions both in the cradles and the cars. One would naturally think that hydraulic or pneumatic cylinders which would provide an adjustable contact between the car side and the cradle would be a practical solution of the difficulty, but the trial of such a device at one of the large docks has proved a disappointment, and the chief reliance for relief is now based on the proper use of the wooden blocking which the committee recommends.

IT is not an unusual thing for an exhibit in connection with the mechanical conventions to excel all its predecessors. The exhibits have been steadily improving year by year. It cannot be too emphatically stated, however, that this year's is distinctly the best ever made. The floor space occupied is the largest ever used, it is probable the number of different devices shown breaks all previous records, the number of new devices displayed is extraordinary and the exhibit committee and the individual exhibitors have been unusually successful in making both attractive general and booth arrangements. The machinery exhibit is very large, and the number of machines in operation is in proportion. The successful efforts made year after year by the supply men to place on the pier all the mechanical devices that will be interesting or instructive to railway men merits the most unstinted commendation. Furthermore, it calls attention forcibly to the large and important part played by the capital, enterprise and inventive genius represented by the supply fraternity in promoting the safety and economy of railway transportation. This is a point to which attention is not called as often as it well might be. The business ability and engineering skill in the supply trade have been a mighty factor in giving its present character to transportation in this country, and probably no other class of men more frankly recognizes or fully appreciates that fact than the railway officers who year after year attend the conventions of the great mechanical associations.

"AN air pump is the most extravagant thing on a locomotive," said Robert Quayle in his address to the members of the International Railway Fuel Association. He did not mean that the air pump, *per se*, is extravagant but that it is forced to operate at an extravagant rate of speed practically all the time the locomotive is on the road. Even under these conditions they are not infrequently found in train line pressures of not over 50 lbs. during a whole trip of a long freight train, often with two of the largest size air pumps working at top speed. It is not the air pump that is extravagant, it is the waste of air. Every effort is being made to reduce transportation costs by operating the maximum sixe trains. Larger locomotives, grade reduction, large capacity cars, accurate tonnage rating, everything, is directed toward more ton-miles per train and per hour. There can be no backing down in this effort. The big train is here, and will continue to get larger, and its pressure is the cause of the trouble with air pressure in the train line. The trouble in this case cannot be cured by removing the cause. Much of the waste of air in the long trains occurs at the hose couplings between the cars at the head of the train. This is especially the case when some of the older equipment occupies this position, and is greatly aggravated by cold weather when the hose is stiff. This weather equipment will be in use for many more years and it appears that the committee on Train Brake and Signal Equipment has in it a problem sufficiently serious to warrant careful and prompt investigation.

IN discussing the report on Overhead Inspection of Box Cars there seemed to be a feeling on the part of some that the faulty condition of the equipment from the standpoint of damage and loss to freight was due to negligence on the part of the car department officers in not insisting on a higher standard of upkeep. If this is true then the Master Car Builders' Association should take immediate and thorough steps to remedy the difficulty, for a reading of the discussion of this report will convince anyone that an unsatisfactory condition exists at the present time. This was also demonstrated in the series of articles on Defective Box Cars and Damaged Freight which appeared in the RAILWAY AGE GAZETTE during April and May of this year. The conditions of the box car equipment on most roads is such that it cannot be put in proper shape without the expenditure of considerable sums for replacing defective parts with satisfactory ones. The master car builders cannot do this without support and authority from above. Mr. Brazier's resolution to the effect that the matter of defective equipment be called to the attention of the American Railway Association is on the right track. There is no question but that the members of the Master Car Builders' Association can keep the equipment in good condition if it is properly constructed in the first place, but if it is not and the railway executives are the only ones who can remedy the difficulty by authorizing sufficient expenditures to put it into first-class shape. Moreover, the only way in which concerted action can be had on all of the roads is for the American Railway Association to take the matter in hand and insist that proper measures be taken to bring this about. It cannot be accomplished in a day. If only those cars which are burglar and leakage proof were allowed in service, practically the entire box car equipment of the country would be tied up. It will take time to clear up the situation, and serious as the condition is and much as it needs to be remedied quickly, care must be taken to go about it in the right way. The logical course, as already suggested in the RAILWAY AGE GAZETTE, would be for the American Railway Association to take steps to see that all new cars are properly built, and that the ones now in service are properly fixed up as they go through the shop for heavy repairs. The conditions would thus be entirely cleaned up within a few years.

FREIGHT CAR TRUCKS.

IN the earlier years of the Master Car Builders' Association efforts were made to adopt a standard freight truck, and several successive committee reports were made on the subject. Car capacity was then growing from 40,000 to 60,000 and 80,000 lbs., and increasing loads made new designs for trucks necessary. The association was then, as it has since, unconsciously perhaps, appointing committees to recommend standards which it did not intend to adopt. And so the reports on standard freight trucks were received but never adopted. In later and more recent years the principal details for freight trucks have been separately taken up for investigation as to materials and proportions, until nearly all have been considered, and there is at hand sufficient recommended or standard practice to make up a complete truck. The first and most important standards were the axle, journal box and bearing, the wheel and brake shoe, as these were the parts which wear out and require most frequent renewals, often on foreign lines. The economy, convenience and time saved by the standardization of these parts probably exceeds that relating to any other railway standards, as the renewals are made in such large numbers.

The two reports on truck details presented this year complete the list of the more important details. That on springs takes up the important question of obtaining greater flexibility in springs under high capacity cars. The space for springs in the accepted designs for freight trucks is so small that spring bars of large diameter are necessary to obtain sufficient strength with steel which cannot be safely stressed beyond 85,000 lbs. per square inch. These large bars make a very rigid spring with a small range of deflection. The committee has in view the use of alloy steel bars, heat treated and carefully tempered, so that a safe working stress of 100,000 to 120,000 lbs. per square inch can be used. With such material the size of the bar can be reduced, the deflection increased and a much easier motion obtained.

For 50-ton cars the springs should be more flexible than they now are, so that the truck will not be so rigid when the car is empty or lightly loaded. This is especially true for the proposed springs for the trucks of 70-ton cars where the bar is 1⅜ in. in diameter. The spring makers should supply springs made of higher grade steel, and the association could secure better results by making a standard specification for freight car springs which can only be met by a steel having a much higher working stress than that heretofore used.

The railways are to blame in buying freight cars under sharp competition, where metal fixtures of ordinary quality are accepted in consideration of the low price. It is for this reason more than any other that the quality of freight car springs has not improved. The report on freight car springs includes a design for 140,000 lb. capacity cars, while that on freight truck sides deals with the requirements for 80,000 lb., 100,000 lb. and 150,000 lb. capacity cars. It would seem desirable for the association to settle on 150,000 lb. capacity as the next step in increased car capacity, and see that all details considered as standard are proportioned for that capacity. This will avoid the multiplicity of dimensions which must follow if intermediate capacities are included.

The report of the committee on Freight Truck Sides and Bolsters is not a final one, because the association has not provided funds for the tests of complete structures, necessary for the proper preparation of the specifications. The recommendations are based on current practice as regards the quality of the material, which is low carbon and low strength steel. An ultimate strength of 60,000 lbs. per square inch can be obtained from the most ordinary steel casting, and, considering the magnitude of the stresses to which freight truck sides and bolsters are subjected, it seems desirable that a higher grade of material should be obtained so that the sections of the structure are not made larger and heavier than necessary. Some of the lines are already using a specification which requires a grade of steel having an ulti-

mate strength of 80,000 lbs. per square inch—33 per cent. higher than that recommended in the report.

It is not clear why the committee recommends that its specification for the quality of the steel castings should be adopted as standard, when its investigation is incomplete and it is unable to make definite recommendations concerning physical tests of the completed structure. It seems desirable that a standard specification should be based on an investigation of the best material available. The truck sides and bolsters of the truck for a 75-ton car will have massive proportions if low strength steel is made the basis of its dimensions, and the railways should not be required to haul an excessive dead weight when the minimum weight which is necessary for safety can be obtained by the use of a proper grade of cast steel and by good engineering design.

GOVERMENT REGULATION OF SAFETY APPLIANCES.

THE Master Car Builders' Association did very little regarding the matter of safety appliances. Doubtless it will be possible to make the same statement next week in reference to the Master Mechanics' Association. There are two main reasons for this. One is that the safety appliance specifications adopted by the Interstate Commerce Commission are still new, and as in the main they are satisfactory under present conditions, there was not much opportunity for suggestions or discussions of proposed changes. The second reason is that legislation and the commission having taken the determination of what appliances shall be used out of the hands of the railways, there is a natural, and probably inevitable, disposition on the part of railway men to give comparatively little consideration to that matter.

There is a danger in this situation of affairs to which attention should be given during the present period of transition. It must be perfectly evident to every intelligent and thinking person that the Interstate Commerce Commission and its inspectors do not know, and never can know, the needs of the railways in respect to safety appliances and the best methods for meeting these needs, as well as the operating and mechanical officers of the railways know them. Even if the commission should employ as its advisers some of the most experienced and expert mechanical men in the country, who were not in railway service, they would be less able to decide what changes in appliances should be adopted from time to time than would the operating and mechanical officers of the railways; and the commission has no such expert advisers now. It is unfortunate that the commission and its inspectors sometimes seem inclined to proceed on the theory that it is their function to catch the railways in breaking the laws and to prosecute them for it, rather than to co-operate with them in preventing accidents and removing their causes. This tends to excite antagonism and fear on the part of railway men, and to prevent them from engaging in that free discussion among themselves and from offering freely that advice to the commission which is so essential both to the most salutory administration of existing laws and regulations, and to the future progress in the development of the devices and methods that are necessary to best promote the safety of transportation.

However, the present safety appliance specifications were adopted and the present boiler inspection law was framed after full consultation between the commission, the representatives of the railways and the representatives of the railway brotherhoods; and it is to be hoped that the same policy will obtain in future.

The success of government regulation will be much greater and more certain, and economy and safety in transportation will be best furthered, if the commission will on all occasions frankly indicate to railway officers that it fully recognizes its need, and sincerely desires the benefit of their great collective experience and knowledge, and if railway officers will freely place their experience and wisdom at the commission's disposal. The policy that will, in the long run, get the best results, is for the commission merely to give the force of law to the best judgment of railway men. If it tries to do any more than this, it will do a great deal less. Public regulation should seek to prescribe ends, not means; regulating authorities are competent to say what ought to be accomplished, but they are, and always will be, far less competent than practical men in actual service, to say how it ought to be accomplished, and when they try to usurp the functions of the railway manager, the railways will be neither well regulated nor well managed.

IMPROVED BOX CARS.

WHEN the valuable features of this convention are considered, we venture to predict that the subject of "box car defects," as explained at length in the report on The Overhead Inspection of Box Cars, and further illuminated by the discussion, will stand out prominently as the most important. The number of box cars now in service in the United States is nearly one million, or more than 45 per cent. of the total freight equipment. A large proportion of them have wood underframes. Antiquated types of wooden roofs and poor door fixtures are also found in large numbers. Even where steel underframes are used the attachment of the wooden superstructure is frequently of poor design, so that there is even more leakage of grain than in a good wooden car. The box car body has been made stronger by the use of larger posts and braces, but the soft pine siding and lining is not as good as that used on the older cars built when sound lumber could be obtained for the purpose.

Taken altogether, the box car is the weak member in the train, and when roughtly used in classification yards and by the application of heavy brake pressure, producing sudden stops in main line service, there is a movement in the joints which results in defects, and the inertia of the door under the same violent shocks soon destroys its stops. The speed of handling freight cars in yards is based on the resistance of all-steel hopper and gondola cars, but the box car has not sufficient strength for such rough handling without damage. Under this service the general condition of box cars has become dilapidated, and the defects are such that the lading of grain, merchandise, flour and similar commodities is not properly protected. A defective car body does not render the car unsafe to run, and inspection and repairs have been directed principally to the trucks and underframe.

The large losses due to grain leakage, theft, injury by water due to leaky roofs, and similar defects are now calling forcible attention to the necessity of proper repairs to the car body. The report of the committee on Overhead Inspection of Box Cars should be regarded as a preliminary one which shows the gravity of the situation and the necessity for greater care in providing equipment in proper condition to protect lading liable to loss or damage in transit. A further consideration of the subject should concern itself with necessary improvements in the design of box cars so they will not be so liable to injury as the older equipment.

The ordinary wooden box car which is still built in large numbers is no longer suitable for modern conditions. A steel underframe as strong as that of other cars should be regarded as a prime requisite, and the design of the car body should be such as will substitute steel for wood whenever it can be economically applied. A pressed steel end has been successfully introduced on a few box cars, and it adds greatly to the strength of the car. Steel carlines and metal roofs are also largely used, and a steel door which combines the grain and side door in one is now being applied to some new cars. Improved door fixtures which overcome all the objections which were pointed out in the discussion are now available, and it would seem proper for the association to standardize some of these improved box car fixtures or require their equivalent.

Announcements.

TO-DAY'S PROGRAM.

M. C. B. ASSOCIATION.

Individual paper, Car Shop Apprentices, I. S. Downing, M. C. B., L. S. & M. S.	9.30 to 10.00
Discussion of reports on:	
Train Pipe and Connections for Steam Heat	10.00 to 10.30
Tank Cars	10.30 to 11.00
Specifications for Tests of Steel Truck Sides and Bolsters	11.00 to 11.30
Capacity Marking of Cars	11.30 to 11.45
Lettering Cars	11.45 to 12.00
Unfinished business; reports of committees on correspondence, resolutions, and such other committees as may be named during the convention	12.00 to 12.15
Election of officers	12.15 to 1.30

Adjournment.

ENTERTAINMENTS.

Orchestra Concert, 10.30 A. M.—Entrance Hall, Million Dollar Pier.

Orchestra Concert, 3.30 P. M.—Entrance Hall, Million Dollar Pier.

Musicale, 9.00 P. M.—Entrance Hall, Million Dollar Pier.

RAILWAY CLUB SECRETARIES.

The annual meeting of the Society of Railway Club Secretaries will be held at 10 o'clock Saturday morning, at the Marlborough-Blenheim. At 7.30 o'clock in the evening the members and their friends will have their annual dinner at the Strand Hotel.

DISCS ON BADGES.

The Enrollment Committee has a request to make of the railway men, and it is this: "Please be sure to see to it, in each and every individual case, that the proper disc, given when you register, is worn around your membership button on all occasions."

UNIVERSITY OF ILLINOIS DINNER.

The University of Illinois men attending the conventions will have their annual dinner at the Shelburne this Friday evening at 6.30. Illinois men are requested to leave their names with Parker G. Stevens, at the booth of the Railway and Engineering Review.

SEMI-ANNUAL MEETING OF ASSOCIATION OF RAILWAY ELECTRICAL ENGINEERS.

The semi-annual meeting of the Association of Railway Electrical Engineers will be held today at the Dennis hotel. The morning session will begin at 10 o'clock and will be devoted to business. The afternoon session begins at 2.00 P. M., when addresses will be made by A. I. Totten, of the General Electric Company, and F. H. Herzsch, of the Westinghouse Electric & Manufacturing Company, on "Railway Shop Equipment." A. J. Sweet, of the Halophane Company, and L. Schepmaer, of the Safety Car Heating & Lighting Company, will talk on "United States Postal Car and Passenger Car Illumination." Informal talks on "Method of Axle Generator Control, Constant Current vs. Constant Potential," will also be given by manufacturers of axle car lighting systems.

SIGN THE PETITION!

Manufacturers attending the conventions can sign the petition regarding a railway plank in the platforms of the two political parties, adoption of which the Railway Business Association is seeking, by stopping at the table in THE DAILY'S booth just inside the railing separating the booth from the ball room. The Railway Business Association is very anxious that all supply men who have not already signed, shall do so at once so that a large petition can be presented to the republican convention next week in Chicago.

George A. Post, president of the association, who has been presenting its views to the republican chieftains now gathering in Chicago, arrived in Atlantic City, Wednesday evening to spend a short time here. He will return to Chicago tomorrow. Mr. Post says that the petitions are being numerously signed, not merely by railway supply men, but by shippers generally. Petitions have been received signed by 600 shippers in Chicago, 400 in Pittsburg, 600 in Cleveland, etc., and a total of 2,000 names had been attached to them at latest reports, the railway plank favored by the association was outlined in THE DAILY for June 12, page 1270.

WANTED—WESTERN BALL PLAYERS.

The Western baseball team wants two railway men and two supply men. Must be good players. Apply to Capt. Hammond.

FOUND.

Small gold initialed pin at the Marlborough-Blenheim informal dance Wednesday evening. Apply at the office of THE DAILY.

REGISTRATION HOURS.

The Enrollment Committee announces that its books will be open for registration purposes on Saturday from 9 a. m. until 12 noon; and from 7.30 p. m. until 10 p. m.; also on Sunday from 11 a. m. until 1 p. m.

PURDUE DINNER.

The Purdue graduates here at the convention will get together at dinner on Saturday evening. All Purdue boys are cordially invited to attend. Please register as soon as possible with Harold A. Smith, of the Railway and Engineering Review, booth 12-14.

CLEAN YOUR BOOTHS.

President Stafford, of the Railway Supply Manufacturers' Association, requests that exhibitors assist the committee to keep the aisles clean by having their booths swept out each evening before leaving.

Some of the projected railways from Peking, China, into the western and northwestern country have a direct relation with lines in operation and projected immediately south of the imperial capital. Of immediate importance, however, is the recent construction in Shantung and neighboring provinces, the most successful work in Chinese railway fields in 1910 being in this part of the empire. During 1910 the most notable lines completed were portions of the great German system in Shantung, which extends from Tientsin to the Yangtze river, and is generally known as the Pukow-Tientsin railway. The southern portion of the system is in operation from Pukow, opposite Nanking on the Yangtze, to Linghwaikwan, a distance of about 94 miles.

Proceedings.

President Stewart called the meeting to order at 9.40 a. m. Thursday morning.

The President: As chairman of the committee on safety appliances, I want to say, the committee has no formal report to present. The work of the committee last year in conjunction with the Federal authorities was such that the entire case was covered, but there are some recommendations that we are making to the executive committee, the most important of which being the question as to what rules shall be adopted for handling foreign cars, which for any reason must be rebuilt or given general repairs; second, foreign cars shopped for ordinary repairs but not equipped with U. S. safety appliances; third, foreign cars stencilled "U. S. Safety Appliances" but improperly equipped.

In the past year the committee had a meeting with the chief inspector of the Interstate Commerce Commission in regard to having uniform instructions or uniform understanding, and it was found that the chief inspector made those arrangements and relieved a good many situations that were not understood alike by all inspectors. That will probably be the function of the committee in the future, to straighten out matters of that kind, and the committee asks that if any member has any suggestions to make or any questions to ask, that he do not hesitate to write the committee on safety appliances so we can get it uniform for the next convention.

REVISION OF RULES OF INTERCHANGE.

The members and various railway clubs and organizations in the rules of interchange were asked to submit what changes were considered desirable. These have been considered and the recommendations of the committee are given under each rule. Several suggestions were received in regard to changes in Rules 98, 101, 102, 107, 116 and 117, covering the matter of changes in prices for labor and materials. These have been referred to the committee on that subject.

J. J. HENNESSEY,

Chairman, Committee on Arbitration.

Rule 2.—The committee would suggest that this rule be change to read as follows:

"Cars (whether loaded or empty) with defects constituting a violation of the law must not be offered in interchange. The unnecessary movement of leaking tank cars loaded with inflamable materials is in violation of the law. Such cars should be repaired or have lading transferred at the nearest available point. Cars having defects for which delivering company is responsible must be properly carded when offered in interchange. Empty cars offered in interchange must be accepted if in safe and serviceable condition, the receiving road to be the judge in cases not provided for in Rules 3 and 4 and 32 to 88, inclusive.

"Owners must receive their own cars when offered home, subject to the provisions of these rules. Loaded cars offered in interchange, except those having defects constituting a violation of the law, must be accepted. The receiving line may also reject cars not loaded in accordance with the rules for loading materials, A. R. A. car service Rule 15 to apply (see page 22) when transfer or rearrangement of load is necessary. The car transfer check authorizing the transfer

M. C. B. ASSOCIATION—AUTHORITY FOR TRANSFER OR ADJUSTMENT OF LADING.

(NAME OF ROAD)

Date

Lading

Transferred or Lading Adjusted. Account of

Issued to R. R.

Car No. Initial

Inspector at

NOTE.—To be printed in black on white paper in duplicate form, filled out with ink or black indelible pencil. Original to accompany bill and duplicate retained for record.

Send bill and this check card to

Fig. 1—Car Transfer Check.

or rearrangement of lading to be of the form shown herewith. Balance of rule to remain as at present.

"The form shown above to be modified by the addition of the words 'or lading adjusted.'"

Rule 8.—The committee would suggest that for the words "tacked on" in the fifth line the words "securely attached to," be substituted.

Rule 9.—The following suggestions are approved:

Change the rule to read:

M. C. B. couplers, or parts thereof, R. and R.....	new or secondhand. steel or malleable. size of shank. size of butt. complete, or name of part or parts. name of coupler. open or solid knuckle. yoke, stem or key attachment.
Wheels and axles, R. and R.	cast iron, cast steel, rolled or forged steel or steel-tired wheels. new or secondhand. cause of removal (see Rule 10). trucks: solid pedestal or arch bar type.
Journal bearings, R. and R..	solid, filled or other kind. length of bearings. box number (see Rule 14.)
Metal brake beams, or parts thereof, R. and R.....	make or name of beam. new or secondhand. complete, or part or parts. cause of renewal. parts or parts scrapped.
Brake shoes, applied.....	Cast or reinforced back.
Triple valve, R. and R.....	Name of maker and type.

When triple valve or cylinder is cleaned, the initial of road and date of last previous cleaning must be shown. If necessary to remove load to make repairs, as specified in Rule 107, it must be plainly stated.

Rule 10.—The committee recommends that all of the first paragraph after the word "used" in the third line be omitted.

Rule 11.—The committee recommends making the rule clearer as follows: "Journal bearings having a babbit lining ⅜-in. thick or thicker, shall be charged as filled journal bearings and not as solid journal bearings."

Rule 12.—The committee would propose the following additional paragraph: "If an intermediate line finds it necessary for safety to standardize wrong repairs, it may render bill against the car owner for the expense, and the billing repair card of such intermediate line shall be final as to the fact that such wrong repairs existed, and shall perform the same function as a joint evidence card. If the car carries repair card covering such wrong repairs, such repair card must accompany bill against the car owner. If such repair card covers items other than those corrected, the items corrected must be crossed off and the card replaced on car, but a copy of such repair card must accompany the bill against the car owner."

Rule 14.—The committee proposes that the first part of the

rule read: "Defect and repair cards (and joint evidence cards, as per Rule 12), must be securely attached to car," etc.

Rule 18.—The committee would suggest that this rule be modified as follows:

1. "Couplers that exceed the distance of 5⅛ in. between point of knuckle and guard arm measured perpendicularly to guard arm must have the defective part or parts renewed to bring coupler within gage, in which case owners are responsible. (See drawing, page 11.)

2. "Cars having couplers with stem or spindle attachments or American continuous draft rods will not be accepted in interchange after September 1, 1914."

Rule 20.—The committee recommends that the rule be changed to read: "Cars must be maintained within the limits of standard height for couplers, measured from the top of the rails to the center line of coupler head. Any company finding cars not within the limits of standard height for couplers may repair and charge to owners. As far as possible, cars should be adjusted when empty.

"Empty cars measuring 32½ in. or less shall be adjusted to 34½ in., or as near as practicable thereto, but not exceeding 34½ in. Loaded cars measuring 31½ in. or less shall be adjusted to 33½ in., or as near as practicable thereto, but not exceeding 33½ in. When bill is to be rendered, the height of car before and after altering must be shown on repair cards."

Rule 21.—The committee suggests changing the rule to read: "Bills may be rendered against car owners for the cost of applying temporary running boards and hand rails to cars originally equipped with roofs or running boards to make such cars safe for trainmen."

Rule 24.—The committee suggests the omission of the word "new" in the first line of the second paragraph, as this provision should apply equally to secondhand wheels.

Rule 33.—The committee approves of the addition of "hatch covers" and "vent slides" to the exceptions in this rule.

Rule 34.—The committee approves the omission of this rule.

Rule 35.—The committee would recommend that the rule be changed to read: "After September 1, 1914, cars equipped with couplers having stem or spindle attachments, or American continuous draft rods, will not be accepted in interchange."

Rule 36.—The committee suggests that this rule be eliminated.

The committee would recommend that the heading to combinations (Rules 37 to 42, inclusive) be changed by the addition of the words "and requiring repairs or renewals."

Rule 40.—The committee proposes that the rule read as follows: "Damaged end sill, accompanied by damage to two longitudinal sills."

Rule 42.—The committee approves changing the rule to read: "Damaged corner and end posts, if necessitating the renewal of more than three posts," and would suggest the following note: 'Damage as used in the above combinations is understood to mean injury so serious as to render renewal or repairs necessary to the part or parts mentioned."

Rule 48.—The committee would recommend the rule be changed to read: "Side doors, end doors, roof doors, grain doors, water troughs and attachments, and all inside *parts* or *all* concealed parts of cars missing or damaged under fair usage," etc.

Rule 50.—The committee would recommend the addition of the words "as provided for in Rule 20" to make reference to the provision in this rule.

Rule 52.—The committee would suggest the following change in the fourth paragraph of this rule: "On cars stenciled 'United States Safety Appliances Standard,' or on cars stenciled 'United States Safety Appliances,' lag screws must not be used where bolts or rivets are required by law." Also the omission of the bracket from this paragraph of the rule.

Rule 57.—The committee suggests making the rule read: "All freight cars offered in interchange must be equipped with air brakes, angle cocks, quick-action triple valves, M. C. B. standard 1¼-in. train line and pressure retaining valves."

Rule 54.—The committee approves the suggestion of adding to this rule the words, "that require repairs or renewals."

Rule 56.—The committee approves the suggestion to eliminate this rule.

Rule 59.—The committee suggest the elimination of reference to Rule 56, on account of the suggestion that it be omitted. Also suggest including "broken brake pipes and cross-over pipes due to insecure fastenings" after the words "rust or seams" in third line.

Rule 60.—The committee approves the changing of the last paragraph to read: "Triple valves cleaned must be tested in accordance with the M. C. B. code of tests for repaired triple valves."

Rule 63.—The committee approves changing this rule to read: "Damage of any kind to truck due to unfair usage, derailment or accident that requires renewal or repairs."

Rule 66.—The committee would recommend that the second paragraph of this rule be changed to read: 'After September 1, 1915, cars equipped with brake beams other than all metal will not be accepted in interchange."

Rule 69.—The committee approves the omission of the words "or if it extends ⅛ in. past the center of flange."

Rule 70.—The committee approves the suggestion that the words "or steel tired" be omitted from the third paragraph.

Rule 82.—The committee approves eliminating the last two lines of this rule.

Rule 101.—To conform to the provisions in the proposed change in Rule 20 the committee would recommend the following change in prices:

Altering height of one end of car, over or under center plates or on top of body bolster, net	$1.25
Altering height of one end of car, shimming springs, net	.75

Rule 107.—The committee would recommend the addition of the following item:

Draft timber bolts, tightening up, on one end of car, ½ hour	$0.12

Rule 108.—The committee suggests that the second paragraph read as follows: "No charge to be made for adjusting brakes, angle cocks or tightening unions."

Rule 110.—The committee suggests this rule be changed to read: "Applying center plate or center plate bolts when car is raised to standard height adjusting center plates or body bolster, at same end of car."

Rule 115.—The committee would recommend that the word "nearest" in the eighth line of first paragraph be changed to "designated." Also change second paragraph to read: "Except in cases of trucks of 50,000 lbs. capacity or less, where the railway company destroying the body of car may elect to retain the trucks and settle for them at their scrap value, except that such of the wheels, axles or all metal brake beams as are good for further service, must be credited at their secondhand value under the M. C. B. rules. This paragraph will not apply to trucks belonging to individual ownership."

Also an additional paragraph reading: "The underframes of damaged steel and steel underframe cars when intact and in serviceable condition may be forwarded to owner on defect card."

Rule 122.—The committee would recommend the following change in this rule: "Companies shall promptly furnish to each other, upon requisition, and forward, freight charges F. O. B. point of shipment, material for repairs of their cars damaged upon foreign lines." etc., balance of rule to remain as at present.

Rule 123.—It has been suggested that rule state which party to dispute shall prepare abstract. In case of any dispute or question arising under the rules between the subscribers to said rules, the same may be submitted to this committee, through the Secretary, in abstract, to be signed by both parties to the dispute, to receive consideration by the arbitration committee. The abstract should set forth: An agreed statement of facts; argument of plaintiff and argument of defendant.

The abstract should consist of not more than three typewritten pages, letter size, single space, and should be signed by both parties to the dispute. Balance of rule to remain as at present.

Rule 131.—This Code of Rules shall take effect September 1, 1912.

Page 105. Rule 2. Item (C).—Under item C, Rule 2, of the passenger car code of rules, page 105, the committee would suggest the addition of "shades" and "belts" under the heading of electric lighting, believing these two items should be included in line expenses proratable.

JOS. W. TAYLOR,
Secretary.

The Secretary: In accordance with the request of the arbitration committee, a meeting was held yesterday afternoon at 4 o'clock, at which time a large proportion of the members of the association in attendance at this convention were present. The object of the meeting was to consider the report of the arbitration committee in reference to proposed changes in the rules of interchange. As a result the arbitration committee would recommend the following changes in its recommendations:

Rule 2.—Cars having defects for which the delivering company is responsible must be properly carded when offered in interchange. Empty cars offered in interchange must be accepted if in safe and serviceable condition, the receiving road to be the judge in cases not provided for in Rules 3 and 4, and 32 to 88, inclusive. Owners must receive their own cars when offered home for repairs, subject to the provisions of these rules. Loaded

cars offered in interchange must be accepted, with the following exceptions:

(a) Cars (whether loaded or empty) having defects in violation of the Safety Appliance Acts, must not be offered in interchange.

(b) Leaking tank cars containing inflammable liquid must be repaired or transferred without any unnecessary movement or at nearest available point with least possible risk. Also, cars loaded with explosives shall be handled in accordance with the regulations of the Interstate Commerce Commission.

(c) Cars improperly loaded, when not complying with the rules for loading material.

(d) Lading of open cars when dimensions of lading are in excess of published clearances of roads over which the shipment is destined.

(e) When cars cannot pass approved third rail clearances of American Railway Association.

American Railway Association car service rule 15 to apply (see page 88) when transfer or rearrangement of lading is necessary.

The car transfer check authorizing transfer or rearrangement of lading to be of the form shown under rule 2 of the report.

When the lading is transferred by the receiving line the car, when empty, may be returned to the delivering line.

(Last paragraph as at present.)

Also, that American Railway Association rule 15, as shown on page 88 of the rules of interchange, be changed to conform to the rule as amended by that association, reading as follows:

Rule 15. Unless otherwise agreed, the cost of transferring the lading of freight cars or rearrangement of lading at junction points shall be settled as follows:

First:—The delivering road shall pay cost of transfer or rearrangement.

(a) When transfer is due to defective equipment that is not safe to run according to M. C. B. Rules.

(b) When transfer or rearrangement of load is due to contents being improperly loaded or overloaded according to M. C. B. rules or the Interstate Commerce Commission regulations for the transportation of explosives and other dangerous articles by freight and by express, or when dimensions of the lading of open cars are in excess of the published clearances of any of the roads covered by the routing.

(c) When transfer is due to delivering line not desiring its equipment to go beyond junction points.

(d) When cars cannot pass approved third rail clearances of the American Railway Association.

Second:—The receiving road shall pay cost of transfer or rearrangement:

(e) When cars cannot pass clearances, except as provided in paragraph (d) or when cars and lading exceed the load limit or cannot be moved through on account of any other disability of the receiving line. (Note:—The word "cars" covers both closed and open cars, but not lading on open cars. The words "load limit" refer to the limits placed on bridges, tracks, etc., and not to car capacity.)

(f) When the receiving road desires transfer to save cost of mileage or Per Diem.

Rule 20.—As agreed, the committee would change the word "head to "shank," in the third line of the first paragraph of its recommendation to conform to the terms employed by the Interstate Commerce Inspectors.

Rule 30.—Inasmuch as weighing associations do not now stencil the new light weight on the car, the committee will suggest to the executive committee that the matter should be preferably referred to the American Railway Association from this association, so that any weighing bureau or association light weighing cars shall, in addition, properly restencil the new light weight on the car. In the meantime the present rule should remain as it now reads.

Rule 64.—The committee would suggest that the words "and nuts" in last line of the rule be omitted.

Rule 91.—The committee will refer the proposed changes in this rule to the executive committee, with the request that it will confer with the accounting officers association, and advise whether they would concur in the proposed changes in the rule, leaving the rule as it now stands.

Rule 98.—The committee would suggest that in the last line, the dimension 1/16 in. be changed to 1/8 in.

Rule 102.—The committee would suggest that the last sentence in this rule be changed to read:

No charge to be made for lettering, except when done to preserve the identity of the car and not necessitated by other repairs.

Rule 110.—The committee finds that the word "by" has been omitted between the words "height" and "adjusting" in the second line of its recommendations, and suggests that it be placed there.

The question was raised as to the proper height of passenger car couplers. The committee will refer this to the executive committee for decision.

JOS. W. TAYLOR,
Secretary.

F. W. Brazier (N. Y. C. & H. R.): I move that the report of the arbitration committee be accepted and adopted. (The motion was seconded and carried with no discussion.)

The decisions of this committee were also accepted and approved.

A rising vote of thanks was given the committee for the excellent work they have done in the past year.

PRICES FOR LABOR AND MATERIAL.

The special committee appointed to suggest additional prices or modification of present prices as given in the rules of interchange, to cover all classes of cars, prepared a circular of inquiry requesting recommendations. Replies were received from only 32 railways and 8 private lines.

The following report is submitted:

The committee recommends no action on Rule 116; committee not being certain that they have authority to take this matter up, though mentioned in circular of inquiry, and very few suggestions as to changes were received.

The entire subject of prices for labor and material on passenger equipment is not reported upon for the reason that very few roads made suggestions in regard to changes and on account of the many changes now taking place in the construction of passenger equipment we were unable to give this subject the necessary attention, and recommend it be given further consideration.

F. H. CLARK,
Chairman, Committee on Prices for Labor and Material.

The committee has, however, accepted the recommendations of chairman of Master Car Builders' train lighting committee, which are embodied in report herewith.

Rule 98. Bills rendered for wheels and axles shall be in accordance with the following schedule of prices for material, with the proper debits and credits:

	Present Prices.			Recommended Prices.		
	New.	Second-hand.	Scrap.	New.	Second-hand.	Scrap.
One 36-in. cast-iron wheel....	$10.50	$7.75	$5.25	.....	.....	.....
One 33-in. cast-iron wheel....	9.00	7.00	4.75	.....	.....	.....
One 33-in. forged or rolled steel wheel	23.00	.....	5.00	$21.00	.....	$4.50
One axle, 100,000 lbs.....	21.50	11.75	7.75	20.00	$12.00	7.50
One axle, 80,000 lbs.....	17.75	10.00	6.50	16.00	.....	.....
One axle, 60,000 lbs.....	14.00	7.75	5.25	.....	.....	.....
One axle, 50,000 lbs. or under.	11.50	6.25	4.25	10.00	5.00	3.00
And with an additional charge for all labor for each pair of wheels and axles removed from all arch bar trucks of.	1.75	.....	.....	2.00	.....	.....
And from all solid pedestal trucks of	2.00	.....	.....	2.25	.....	.....

If new wheels and axles are substituted for second-hand wheels and axles, proper charges and credits shall be allowed, although such substitutions be made on account of only one loose or defective wheel or a defective axle with the following exceptions: In case the owner of a car removes a damaged wheel or axle, no

charge shall be made for any difference in value between the parts used and those removed that are not damaged.

Removing, turning and replacing a pair of forged steel or steel-tired wheels: $3.25 for pedestal type of truck and $3 for arch bar truck.

It is recommended that this paragraph be changed to read:

"Labor turning per pair forged steel or steel-tired wheels, $1.25.

"The price for new forged or rolled steel wheels shall only apply to such wheels having treads 1⅜ inches thick or over, measured from base line of tread to the condemning limit which is ¼ inch above witness groove. For wheels having treads less than 1⅜ inches thick as described, a reduction shall be made in price at the rate of 75 cents per 1/16 inch thickness (on radius) of tread.

"Any loss or increase of service metal on forged or rolled steel wheels shall be credited or charged at the rate of 75 cents per 1/16 inch thickness (on radius) of tread."

The necessary information must be given in all cases, as pro-

In cases of slid-flat wheels, 1/16 in. for loss of service metal will be allowed for flat spots 2½ in. long and 1/16 in. for each additional inch or fraction thereof.

It is recommended that this paragraph be changed to read:

"In case of slid-flat wheels, 2/16 in. for loss of service metal will be allowed for flat spots 2½ in. long, and 1/16 in. for each additional inch or fraction thereof."

[The rest of the report is given over to prices of Rules 101, 107 and 111.]

On page 108, Rule 12, the last paragraph should be changed to read: "On electrically lighted cars equipped with storage batteries or axle device, furnished to foreign roads, where no agreement is made, a charge of 75 cents per car per day shall be made for the use of the electrical equipment."

The report is signed by: F. H. Clark (B. & O.), chairman; G. E. Carson (N. Y. C. & H. R.); C. F. Thiele (P. C. C. & St. L.); Ira Everett (L. V.); B. Julien (U. P.); S. T. Park (C. & E. I.), and H. E. Passmore (T. & O. C.).

DISCUSSION.

J. J. Hennessey (C. M. & St. P.): I move that the recommendations of the committee on prices for labor and materials be accepted as prices of the rules of interchange. I have had some years of experience on this rules committee, and the amount of labor that is put into this report is not fully realized by the average member who has not undertaken a similar job.

A. W. Gibbs (Penna.): The committee on tank cars has a price recommendation in regard to safety valves, and also in regard to the periodical retesting of safety valves. I wish to ask for permission to submit these prices, which have been arranged by trial, and if approved by the committee, that they may be included in the list of prices submitted by them.

F. H. Clark (B. & O.): The committee will be glad to receive and consider the prices and take such action as may seem necessary.

J. J. Tatum (B. & O.): I want to say before the motion is submitted, that it was found necessary, due to some changes made by the arbitration committee to all an additional item to Rule 101, which will read as follows:

"Stenciling on sides and ends when done to preserve identity of car and not necessitated by other repairs, net price 50 cents."

The committee's report was then accepted.

RULES FOR LOADING MATERIALS.

The committee reports the following recommendations for changes in the present rules for loading materials. The modifications, in the main, have reference to reductions in amount of material required to build up loads, having due regard for the safety of cars as well as lading in transit. A good deal of information has been collected from railways and shippers in connection with the several suggestions that are recommended.

Attention is called to Rule 6, and with particular reference to its apparent conflict with paragraph *D* of the American Railway Association Rule 15, some allusion to which was made in the report of 1910.

The paragraph reads as follows:

"The receiving road shall pay cost of transfer or rearrangement: (d) When cars exceed load limit or can not pass clearances or be moved through on account of any other disability of receiving line."

After the presentation of the 1911 report the committee recommended to the arbitration committee the acceptance of the last suggestion offered by the American Railway Association, which was to add the following paragraph to Rule 6:

"Should it become necessary to transfer or rearrange the lading in transit on account of excess width or height of lading, see American Railway Association car service Rule 15, paragraph *D*."

This was done under the impression that the supplement would remove the apparent conflict, still leaving Rule 6 in such shape as to allow the shippers to build up loads within reasonable limits, without infringing upon the principle involved in American Railway Association Rule 15. But the application of the second paragraph or added portion of Rule 6 soon demonstrated the wisdom of the rule as it originally stood prior to the change last year, which required that the load be built up with reference to the clearances of the roads over which the lading is routed. In the light of this development the General Managers' Association, of New York, at their meeting held in New York, December, 1911, concluded to suggest to the American Railway Association certain modifications to their Rule 15, having further in mind that in the event of the American Railway Association adopting such changes the Master Car Builders should be requested to modify Rule 6 for loading materials, erasing therefrom that portion of the rule which was added in 1911, which would leave the rule practically in its original shape. The committee has no further reference to make relative to Rule 6 until the matter is disposed of by the American Railway Association.

RULE 10.—Wooden cars of light capacity when used as idlers between cars of heavier capacity are liable to break down when

A. KEARNEY,

Chairman, Committee on Rules for Loading Materials.

placed in a train composed of heavier capacity cars, in case of sudden stops or emergency application of the brakes; a paragraph, therefore, should be added to Rule 10 reading as follows:

"If the idler is a flat car of wooden construction, its capacity must be not less than that of the carrying cars."

RULE 23.—The first sentence of this rule should be changed to read as follows, so as to also cover the placing of sliding as well as bearing pieces:

"Bearing and sliding pieces must never be placed between bolster and end of car, unless special provision is made therefor in detail instructions."

RULE 43.—This rule should be changed to read as follows:

"The lading overhanging the idler must be governed by restrictions contained in General Rule 11 so that overhang will not exceed clearances in curving."

RULE 45.—The last portion of this rule should be changed to read as follows:

"Where the pile of lumber on the idler exceeds 20 ft. in length, 4 stakes on each side must be used, 3 on each side being sufficient for shorter piles to conform to Rule 34."

RULE 55.—We find that some of the Canadian roads have flat cars equipped with permanent chains and short stakes, which are used for the handling of logs, and having ascertained that logs loaded on these cars with this method of binding the lading are safe, we would recommend the addition of a note to that effect immediately after Rule 55 so as to allow the use of this equipment for handling the material in question.

RULES 56 AND 57.—These two rules should refer to flat as well as low-sided gondola cars and, therefore, should be changed to read as follows:

"RULE 56.—When material of this kind is loaded on flat or

gondola cars with sides less than 30 in. high, and lading does not exceed 4 ft. in height measured from floor, and the lading is not loaded in pyramidal form, the stakes must be as high as the lading and must be tied together at the top with not less than eight strands equal to four wrappings of good ⅛-in. diameter wire and must be tight. Stakes must be sound hardwood, free from knots and of the dimensions specified in General Rule 12."

"RULE 57.—If the material is loaded on flat cars or gondola cars with sides less than 30 in. high, to a height more than 4 ft. measured from floor, opposite stakes must be bound together with wire at about one-third of the height above car floor after one-third of the load has been placed on the car, and in such a manner that when the remaining load is placed on the car the wire will have a tendency to draw the tops of the stakes toward each other. The middle as well as the top wrappings of wire must consist of not less than ten strands equal to five wrappings of good ⅛-in. diameter wire and must be tight. Bearing-pieces may be placed between the lower and upper sections of load to facilitate application of wire after all the lading has been placed on the car. Stakes must be sound hardwood free from knots and of the dimensions specified in General Rule 12. Stakes must incline toward center of car a total of about 12 in. before load is placed on car, and in no case will they be allowed to incline away from center of car after the car is loaded. The inspector must assure himself that all wiring is tight before load is moved."

RULE 58.—The size of the 3 pair of live saplings mentioned in the first sentence of this rule should be 4½ in.

Also add the following paragraph to this rule:

"When lading is in two piles not over 20 ft. in length and ends of piles are interlaced at center of car, there must be not less than five pairs of stakes for total length of load. If the length exceeds 20 ft., there must be not less than six pairs of stakes for total length of load. The ends of poles must extend not less than 18 in. beyond the center stake."

RULE 81.—Some suggestions have been made with reference to handling twin loads of flexible material where the shipment is light and can be handled safely without the use of blocking prescribed for full loads, and in order to make this entirely clear, the following paragraphs should be added to this rule:

"81-A. If the total weight per bolster does not exceed 10,000 lbs., the center post and bolster cross braces may be omitted, provided the bearing-piece is not less than 8 in. x 10 in.

"81-B. For twin loads of plates with two bearing-pieces and two or four sliding pieces, if the total weight does not exceed 20,000 lbs., or 10,000 lbs. per bearing-piece, the center post and bolster cross braces may be omitted, provided the bearing pieces are not less than 8 in. x 10 in.

"81-C. For loads less in weight than those specified in paragraphs *A* and *B*, the dimensions of bearing-pieces may be proportionately reduced as per Rule 29."

RULE 103.—In order to bring the weight of the lading nearer to the allowable limit for double and triple loads, the following paragraphs should be added to provide that girders, either of the solid or latticed type ranging from 10,000 to 30,000 lbs. each in weight, shall be so arranged that two or more can be loaded side by side on pivoted bolsters:

"Two or more girders may be loaded vertically, side by side, provided they are bolted together near pivoted bolsters, with proper spacing-pieces between them, in such a manner that they act as one girder."

Fig. 56.—It is claimed that the method of loading pipe 24 in. or more in diameter on a flat car in accordance with the present rules is wrong on account of there being no provision for holding the second and top tiers of pipe from sliding off endwise. Pipe of this description should be loaded with the bell ends

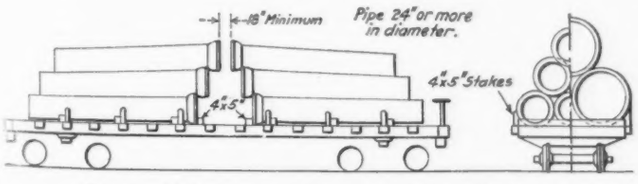


Fig. 1—Method of Loading Pipe on Flat Cars.

toward the center of car, the bell ends of the second tier overlapping the first toward center of car. There should be at least 18 in. clearance between the bell ends of the top tier and when loaded in this manner the end blocking is not required, therefor Fig. 56 should be changed as shown in Fig. 1 herewith.

RULE 121.—Due to objection on the part of the shippers to the size of blocking now specified, and due also to the fact that blocking of smaller dimensions can be used without interfering with the safe movement of boiler shells and tanks, this rule should be changed to read as follows:

"Lading of this description 8 ft. or less in diameter, when loaded on single flat or gondola cars, should be substantially chocked with side blocking equal in height to 1-7 the diameter of the shell, providing that blocking of more than 10 in. in height will not be required. End blocking to be not less than 4 in. in height as shown in Fig. 2 herewith.

"Lading over 8 ft. in diameter, when loaded on single flat or gondola cars with sides less than 30 in. in height, must be sub-

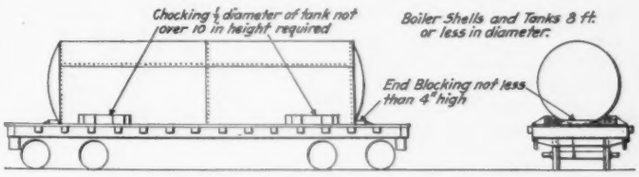

Chocking ¼ diameter of tank not over 10 in height required
Boiler Shells and Tanks 8 ft. or less in diameter.
End Blocking not less than 4" high

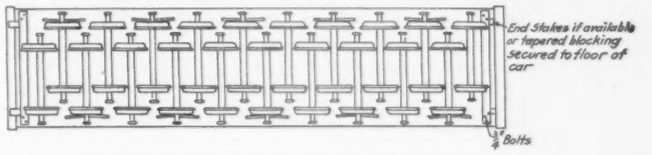
Fig 2—Method of Loading Boiler Shells and Tanks; 8 Ft. or Less in Diameter.

stantially chocked with side blocking not less than 10 in. in height and backed up by the use of stake pockets, and in addition to this must be secured with 2 bands of not less than ¾-in. round iron or flat bands of equal section. End blocking to be not less than 4 in. in height."

"When loaded in gondola cars with sides 30 in. or over in height the bands will be unnecessary, but precaution with reference to blocking must be taken as specified for lading 8 ft. in diameter."

"When such lading is placed upon 2 or more cars as a tandem shipment it should be secured with 2 bands of not less than ⅞-in. round iron or flat bands of equal section, in addition to the prescribed blocking."

"Steel tanks, lined or unlined, in sections weighing not over 2,500 lbs. per section, 8 ft. or less in diameter, when loaded on single flat or gondola cars, must be substantially chocked on each side with blocks not less than 6 in. in height and of sufficient length and width so that they may be securely spiked to the floor of the car. End blocking to be not less than 4 in. in height and of sufficient length to provide for proper bearing area against head of tank or shell and to be securely spiked to the floor of the car. If more than 8 in. in diameter the same side and end chocking is to be used and in addition each tank or part of tank must be secured with 2 bands not less than ⅛ in. x 2 in. in section passing over the top and properly secured to the floor or stake pockets of the car. In lieu of the bands over the top of the shell the same may be secured to the floor of the car or stake pockets by straps of ¾-in. round iron or equal section bolted to the flange of the tank or shell with not less than 2 bolts, the lower end of the strap passing through the floor or stake pocket.



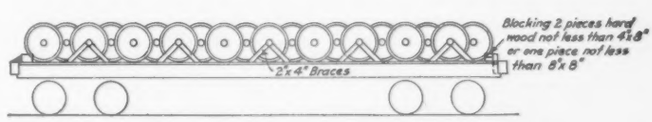
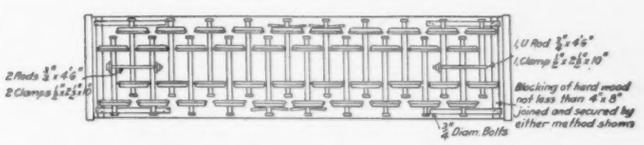


Fig. 3—Method of Loading Mounted Wheels.


2 Rods ¾"x4½"
2 Clamps ⅝"x2½"x10"
U Rod ¾"x4½"
U Clamp ⅝"x2½"x10"
Blocking of hard wood not less than 4"x8" joined and secured by either method shown
¾" Diam. Bolts

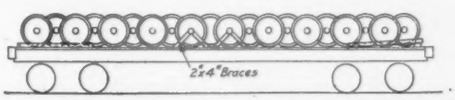


Fig. 4—Method of Loading Mounted Wheels.

A new Rule 122-A should be added to cover the shipment of mounted wheels on flat cars, as follows:

"122-A.—Mounted wheels may be loaded on flat cars as shown in Figs. 3 and 4. If Fig. 3 is followed the end blocking must be not less than 8 in. by 8 in. in section in one piece, or made up of two pieces of hardwood of equivalent section and secured by end stakes in addition to bolts through floor, or by separate blocking pieces secured to floor and end sill with ¾-in. bolts. In addition to this, for a full load, five pair of wheels must be secured by 2 in. by 4 in. hardwood braces as shown, spiked to floor of car.

"If Fig. 4 is followed, three pairs of wheels at either end of load are to be tied together, using ¾-in. rods with clamp plates or ¾-in. U-rod and plate as shown, and blocking at ends and along sides of hardwood not less than 4 in. by 8 in., joined and bolted to car floor by either of the methods shown in Fig. 4."

The two new figures referred to in new Rule 122-A should be inserted in the code, immediately following Fig. 66 and ahead of Fig. 66-A.

RULE 124.—The second sentence to read as follows (The italics show the words added):

"Cars without doors, *and containing freight of a character requiring it,* must have the lading protected from falling or rolling out of car by strips or slab wood, not less than 1½ inches thick at center, nailed to inside of door posts, and sufficiently close to floor of car and to each other to prevent lading from passing between them."

The present prescribed practice of loading triple loads of long flexible material (angle irons and plates) is open to criticism, but the committee has not had time to make sufficient study of the situation with a view to changing the present rules.

During the current year the committee has received a great deal more assistance than heretofore and it is hoped that it will increase, for it is doubtful if the committee is getting the benefit of the general experience or the many ideas arising in handling commodities under local conditions which must necessarily develop from time to time.

The report is signed by:—A. Kearney (N. & W.), chairman; R. E. Smith (A. C. L.); C. H. Osborne (C. & N. W.); W. F. Kiesel, Jr. (Penna.) and L. H. Turner (P. & L E.).

DISCUSSION.

A. W. Gibbs (Penna.): Does the report include the requirement that the car shall comply with the clearances for the electric third rail, which was adopted by the American Railway Association at its last meeting held in New York last month.

A. Kearney (N. & W.): I do not think that would conflict with rule No. 6, because this places the burden upon the railway having the disability.

Since presenting this report we have received correspondence from the Ohio Quarries Company and the Cleveland Stone Company, in reference to loading stone. We have also had some correspondence with the National Tube Company, and L. C. Bihler, traffic manager of the Carnegie Steel Company. I would like to ask if it will be satisfactory to have the committee go over the questions submitted to us, and then submit the conclusions with the report to the members of the association for letter ballot.

The subjects which Mr. Bihler speaks of are: Plates too wide to go in a single car, overhanging loads in single cars and plates too wide to be loaded flat on gonolas, but may be loaded flat on flat cars, the load being held in place by clamps extending across it, secured by bolts running through the stake pockets. There is no reference to the last item in the present rules either in text or by sketch. When the committee takes hold of this matter they will fully consider all the points. It will be necessary of course to make a safe load.

C. E. Chambers (C. of N. J.): I wish to make a few remarks in connection with the report which has been submitted. I want to have it thoroughly clear in my mind that the recommendation of this committee is that rule 15 of the American Railway Association, and our Rule 6 will put the expense on the loading road, where the loading road does not load according to the clearances, etc., on the lines on which this car must pass. Is that the point?

Mr. Kearney. If you will recollect, and no doubt you will remember, about 2 or 3 years ago we were asked to modify rule No. 6, so as to make it harmonize with the American Railway Association rule No. 15. Rule 15 placed the responsibility upon the road having the disability. That meant that if you load a car, it does not matter how wide, and turn it over to some other road they would be required to take that car, and they would be required to carry the burden, and simply because they could not handle the car on their line because their clearance limits were apparently too small, they would be responsible for the incorrect loading of the car. At a meeting of the General Managers' Association of New York, it was thought that that was untair, and I might say here, it is the position of the committee that this is unfair, we have always considered that such a ruling created a most unreasonable situation. The General Managers' Association at the meeting to which I have referred, decided to except the loads on open cars, which brought it right back to the point we have been contending for for some two years. That means that if you load the car in excess of the clearance limits of the line over which the car is routed, you make the transfer of the load, you as the delivering line.

Mr. Chambers: I want to be perfectly clear on that, because it is a matter of great importance to the Central of New Jersey. We are down on the Seaboard where we get cars from all the roads in the country, and deliver many cars to roads which have all these clearances, and it meant a great deal to us if we had to accept that.

C. A. Schroyer (C. & N. W.): I move the acceptance of the report as a whole, with the supplemental matter presented by the chairman of the committee, and that the recommendations of the committee be submitted to letter ballot.

The motion was seconded and carried.

DAMAGE TO FREIGHT CAR EQUIPMENT BY UNLOADING MACHINES.

The standing committee on rules for loading materials was instructed to investigate the damage to freight-car equipment handled through dumping or unloading machines, and reports that it finds very valuable work has already been done in the same direction by several railways whose equipment, in rather larger proportions, has been handled through such machines, and as a result has sustained considerable damage.

The Pennsylvania and the Lake Shore & Michigan Southern took hold of the question some time ago and were very successful in locating several fouling points and parts throughout a number of unloading machines responsible for damage to cars.

Some time ago a committee was appointed on the Pennsylvania to investigate the subject and to make observations where some of the larger unloading machines were in use; they found that more than 95 per cent. of the cars were damaged in one way or other as they were handled through the machines, and further that the safety appliances were damaged on something like 32 per cent. of the cars.

It seems this situation arose principally through lack of uniformity in unloading machines as well as in cars, and that the greatest percentage of damage is occasioned by the condition and relative position of the clamps, also the breast plates, blocks, etc., against which the cars rest while being rotated in the machines.

It has been the thought of the committee to secure plans from manufacturers showing the relative position of the bearing points assumed by the cars as they are handled in the machines and then develop a composite diagram showing the relative position and limitations of such areas. It has also been the idea that if it will be possible to gradually reduce the increasing variety in car designs in such parts, at least as foul the lines and areas as might be determined upon, a great deal will have been accomplished toward reducing the expense now incurred on account of damage to cars, and at the same time minimize delays to equipment.

It was hoped by this time more information would be secured with relation to dumping machines, also composite diagrams from all roads showing the various classes of freight equipment likely to be used in such machines, believing that with complete information along this line some headway might be made by putting the respective composite plans together into one large sheet so as to show to the builders of machines, as well as to railways and car builders, the bearing areas they have each independently appropriated.

The two phases of the question, namely, the one relating to the design of the machine, as well as the car, are so intimately associated that the best results are only to be accomplished by endeavoring to solve the two problems together; but to what extent it is going to be possible to do this remains to be seen. Although the committee has received assistance from some of the railways as well as the manufacturers of unloading machinery, they feel confident that the field has not been covered, and, therefore, the work is still incomplete.

The work of the committee seems to show that so far as the types of unloading machines are concerned, there are practically three schools of design to meet. While the various types differ somewhat in detail, the general arrangement or systems are represented by the three following descriptions:

First: One in which the car is run onto a supporting track,

which slides transversely on a cradle, being held in place by clamps from underneath when the machine is in its normal position. Four chains are passed through hollow hook clamps to counterweights on the opposite side of the machine and are attached to the supporting track. The hook clamps move vertically in guides on the cradle sides, and are held at a height sufficient to clear any car, by means of vertical rods which extend to seat blocks underneath the cradle. When the cradle is raised the cams disengage and the supporting track is pulled over by the counterweights until the weight of the car braces itself against the cradle side. The hook clamps fall by gravity until they have assumed a bearing on the top flange of the car.

Second: One in which the car is run onto a supporting track which tilts on a horizontal shaft until the car has a bearing on the cradle. This arrangement has chains and hook clamps as above described, but the latter are anchored in the cradle side instead of to the supporting track.

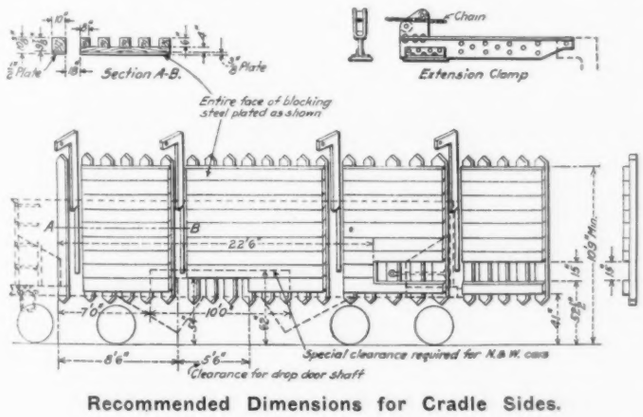
Third: One in which the supporting track is stationery, and the cradle side is moved inwardly and up against the car by pistons.

In all three types of machines the clamping arrangements are quite similar, consisting of hooks and clamps. A great deal of damage now sustained by the equipment is due to the manner in which the car is seized by the clamps and other apparatus belonging to the dumper, and the bearing the car assumes up against the side of the cradle, also in some instances on account of clamps being missing and chains alone being used to hold and steady the car. In some machines the cradle sides are constructed with insufficient bearing surface for the car to rest against, or they have bearing surfaces fouling the ladders, grab-irons and other parts of the car as it is being rotated in the unloader.

In the revolving type first described, the lifting as well as the rotating motion of the machine carries the car sidewise until the car sides rest up against the cradle, regardless of the width of the car. This is for the purpose of supporting the car on its wheels and on one side in the rotating movement.

There was a joint committee representing several roads sent out not long ago to examine a number of dumping machines, and their report was to the effect that they considered it possible to readily modify the cradle and blocking of the first two types of machines so that the safety appliances and other parts would be subjected to little chance of being damaged. A modification in the third type, however, would seem to be more extensive.

Plans are shown herewith giving recommended dimensions for cradle sides, which it is believed will diminish, to a very



Recommended Dimensions for Cradle Sides.

large extent, the damage to cars, provided each car is properly spotted. The support of the sides of the car consists of four sections, each composed of 6 in. by 8 in. vertical pieces, upon which are carried horizontal boards 4 in. thick fastened thereto, and plated with ⅜-in. steel. The proposed design of extension clamps is shown in detail in the illustration.

The cars are intended to be spotted so that the ladder end is clear of the end section. The two sections at the opposite end are cut out to provide clearance for the side handholds for cars of various lengths. The dotted lines covering part of Sections 1 and 2 show the amount that must be cut out for Norfolk & Western cars where the drop door rigging is located rather high and spaced farther apart than on many other classes of cars. This recess need not be provided except on machines in territories where such cars are handled.

The committee, in submitting this report of progress, states that as the subject is of such wide importance it should have more time.

The report is signed by:—A. Kearney (N. & W.), chairman; W. F. Kiesel, Jr. (Penna.); R. E. Smith (A. C. L.); C. H. Osborne (C. & N. W.) and L. T. Turner (P & L. E.).

Mr. Kearney presented the report, and in connection therewith said: Since preparing this report, I have talked over with some of the manufacturers of unloading machinery, this subject, and we discussed the matter at considerable length. They have all expressed themselves as being willing and anxious to help the committee in its work.

DISCUSSION.

H. La Rue (C. R. I. & P.): We are concerned with these unloading machines in the West. The mineral products in the West are being developed, especially along the line of the erection of cement buildings. The factories are placed, and the limestone quarries are at quite some distance from the factories, and the cars are loaded with limestone at the quarries and then taken to the factories, and they are now using dumping machines, of course, in unloading the limestone, in all classes of cars, and we are finding serious damage done to the cars by the unloading machines. I have seen no reference in the report, nor have I yet had an opportunity to find out from the railways on the Lake ports who is responsible for the damage done to the cars by the unloading machine. I would like to hear something on that point.

I. S. Downing (L. S. & M. S.): In reply to Mr. LaRue, I will say that I happen to be on a committee that is investigating this subject in the Lake territory. We handle a good many Norfolk & Western cars, which require a special provision made in the blocking of the unlocker to take care of the winding shaft. When the car is turned on its side, the shaft would sometimes project beyond the side and shove the side of the car in. This occurred on cars of the Pennsylvania line, and the Pennsylvania line was held responsible for that damage. There is no use in trying to collect from the people who own the machines or the company which operates them. Generally the railway companies own the machines and lease them to the people who operate them. The damage has not been done in connection with the kind of a cradle, which is shown in the report of the committee, but with the old style of machine that has a plunger which is forced out of the side of the car, out by air pressure, and that forces the side of the car in. There are two or three of these machines used in the Pittsburgh district.

Mr. Downing: It is very important that some general practice be adopted. The steel people and the coal people seem to be willing to do anything we want, but they do not want to have to change this blocking every six months. The blocking which is shown here solid, we feel absolutely sure will take care of the safety appliances. It is gained in on one end to take care of the handle. On the outer span the ladder clears the cradle. In order to apply these appliances shown, it will be necessary for some of these machines to be reinforced in the cradle which is quite a little job and involves some expense. In building cars for this territory, the designer should consider the cradles on these large machines because they cannot be changed to suit the conditions called for in a few cars that some fancy designer may get up.

R. L. Kleine (Penna.): The design which the committee presents I feel is a good one, in that it presents a plane surface. There is one thing in connection with the design, and that is the reinforcing plate, which they apply to the face of the planking. An objection has been raised to that feature at Lake points and tidewater ports in winter weather for the reason that the load would be liable to slip along these plates, whereas that would not be the case if they had wooden blocking. But I feel that the design presented is one which will avoid a whole lot of damage to cars. The design should be applied to a number of cradles, so that we could get some experience with regard to its service. Also the committee should be continued so that they can go further into the question, and make some recommendation as to necessary changes in the Brown dumping machine which have the plungers and which are now badly damaging cars.

John J. Tatum (B. & O.): We have had some experience in Pittsburgh and on the Lake ports with dumping machines, and we found about three years ago that the dumping machines were damaging many of our cars on account of the method of blocking arranged on the machines. As a result of our investigation we have had the blocking so located that it has avoided a great deal of that damage to the cars, the side of the cars, by the machines, and we have so arranged the blocking that when the cars turn over the bearing will be so distributed that it will be taken care of on the stronger portions of the construction of the car, and in this way we will prevent damage to the car. Since that time we have

been getting along very nicely. We have not had our cars damaged to as great an extent as previously.

It is not only the dumping machine which is worrying us now, but the fellow who comes along after the car is loaded with ore, and puts an excess load on them, and then comes along with a traveling crane, with a clamshell bucket on it, and takes out a portion of the excess load, and also carries out the cross bracing; and because of this, new Rule 15 is going to make a little trouble for us as it will allow our cars to spread, and that is one of the new developments we must look into.

Mr. Kearney: May I ask Mr. Tatum how they would distribute the loads on the sides of the car that he referred to?

Mr. Tatum: Blocking sometimes was placed so that it would bear on an area of the sheet that had no support on the inside of the car, and that would result in crushing the car on the inside. By placing the blocking so that it would be back of the supports on the inside of the car we prevented this, but it was not only the crushing in of the side of the car that gave us trouble; we also damaged the safety appliances. The blocking was not deep enough, did not have the necessary clearances for the grabirons, etc.

Mr. Kearney: You mean by reason of not having a suitable or sufficient bearing, the cross braces will fail?

Mr. Tatum: Yes.

Mr. LaRue: I would like to ask in connection with the use of the unloading machines at lake ports: Do they use these machines in the case of all classes of coal cars, and similar cars, with inside and outside stakes, and cars having from two ft. sides to four ft. sides, promiscuous cars, foreign cars, wooden cars, etc.?

Mr. Kearney: I should think if we could answer that question in the affirmative, the work of our committee would be complete. We tried to include in our report a consideration of all the cars now being operated with these machines.

Mr. Tatum: Possibly I misunderstood Mr. Kearney's question. It has been suggested by some of the members sitting near me that I did misunderstand it. If so, I want to correct it. I understood that Mr. Kearney wanted to know what effect there was from the loss of the bracing, which resulted in spreading the car, brought about by the unloading machine—

Mr. Kearney: You said the absence of the bearing.

Mr. Tatum: That is correct—I said the absence of the bearing allowed the sides of the car to spread.

Mr. Downing: In regard to the plate recommended by the committee to prevent wear. We found that the horizontal blocking as well as the vertical blocking on the machines is badly worn, and there would not be an even bearing along on the angle of the stakes. The recommendation of this plate is simply to prevent wearing of the blocking.

The report of the committee was accepted and the committee was given more time in which to carry on its work.

H. L. Trimyear (S. A. L.): I would like to make a recommendation that the committee on prices for labor and material be continued for another year, as I think that the revisions made are very large, and a great many questions are going to arise, covering these prices, that will be referred to the arbitration committee, and I think the committee will be able to help the arbitration committee to solve these problems, and I also think that there are some more new prices that should be considered, and one of which would be the welding of tank cars which we are all coming into the use of now, and which we have no prices to cover.

The President: If there are no objections on the part of the association, the suggestion made by Mr. Trimyear will be referred to the executive committee.

OVERHEAD INSPECTION OF BOX CARS.

The committee on rules for loading materials, to whom was assigned the formulation of rules for overhead inspection of box cars for loading, makes a report in the way of explanation, that it does not feel it has had sufficient time to cover the field as carefully as the subject would seem to warrant, hence the report is offered as one of progress. Still the problem is not a new one; on the contrary, every road in the country is striving to control as best they can, and the fruits to be secured by concerted action on the part of all roads are unquestionably conceded.

From 1900 to 1910, the payments by the railways for freight loss and damage per annum has increased in the United States from $7,055,622 to $21,756,671. These figures do not include the enormous clerical expense involved in the investigation and handling of claims. Furthermore, it is estimated that the unreckoned inconvenience and loss of time, by the public, incident to these failures of transportation, represents another loss about as great.

The extent of this apparent loss has become a matter of so much concern to the management that the American Railway Association has taken official cognizance thereof, through its committee on relations between railroads, and a special committee, composed of three representatives from the three General Managers' Associations, has been created, and is known as the committee on marking, packing and handling of freight.

This special committee has gathered a great deal of valuable data, and its statistics relating to losses growing out of or incident to, the condition of car equipment seemed to be of so much interest, that Mr. Hale, chairman both of the special committee and the committee on relations between railroads, raised the question with the Master Car Builders' Association, suggesting a joint meeting between their executive committee and the sub-committee on marking, packing and handling of freight, which was held in New York in December, 1911.

Inquiries had been sent out by the committee on relations to some of the larger systems asking for amount of claims paid on account of defective equipment covering the month of November, 1911, resulting in the following:

Total mileage of roads reporting	82,360
Gross earnings	$111,004,783.00
Claims paid:	
Account of leaky cars	22,228.10
Defective cars leaking contents	19,919.89
Projecting nails, etc.	529.08
Dirty cars	1,625.61
Other causes	1,341.37
Total claims paid as above	59,650.15

While the roads reporting showed an aggregate mileage of 82,360, with gross earnings amounting to $111,004,783, and a total amount in claims of $59,650.15, it is possible that some of the claim figures are incomplete; still the details are of interest and should be accepted as showing in the aggregate the extent of such losses. Going a step beyond this the committee has equated the figures, calculating what the loss might be per year for all roads which totaled, as will be seen, $139,194.01. The details are as follows:

Gross earnings for the year	$259,061,997.00
Damage claims per year from—	
Leaky cars	51,919.37
Projecting nails, etc.	46,351.61
Dirty cars	3,793.04
Other causes	3,062.27
Unclassified	32,710.59
Total	139,194.01

While the losses directly assignable to defective car bodies are not the largest feature of the total loss, it is probably true that such items as inefficient car doors (facilitating robbery or pilfering), etc., represent another considerable source of loss indirectly chargeable to the cars, which do not appear in the figures.

It seems to the committee that without directly undertaking an answer to that question, there are two distinct avenues through which an improvement can be directly approached, namely:

First—Concentrate the responsibility for losses due to defective car bodies in such a manner as to provide an automatic incentive for the use of better cars.

Second—Establish standard requirements for the inspection of car bodies.

The General Managers' Association of the Southeast has been giving a great deal of attention to the general question of freight loss and damage, and the feature of defective car bodies has been under consideration. On April 9, 1908, they called a general meeting of officers of several departments of lines in their territory to which representatives of roads in other sections were also invited, and their minutes show the following:

Defective Cars.—A committee on loss and damage make a report as follows: "It is unfortunately true that the scarcity of equipment has almost compelled the use of cars which were defective in roofs, doors or end windows, but which were kept in service as long as the running gear was entirely safe. We would suggest a closer inspection of the bodies of cars, especially box cars, before loading, projecting nails removed, and if roofs and sides are defective, that they be placarded, 'Not to be loaded with freight that could be damaged by rain,' and be loaded towards home with nondestructive freight, in order that owners make thorough repairs necessary before cars are again permitted to go in service."

This recommendation was unanimously approved and endorsed. The present car doors and car-door fastenings were also condemned, and it was the sense of the meetings that it was very important that a more satisfactory door and secure fastenings for car doors be devised.

The result of their inquiries was, they reached the conclusion that the rules of the Freight Claim Association so operated

as to split up the loss in each case between all the lines participating in the haul, so that the gravity of the deficiency was not brought home to the original loading road. It appears in claims of this character the loading line can throw the loss on the route as a whole, by showing that there had been the "usual and customary" inspection at point or origin. This is so vague as to really mean little or nothing, according to the laxness of the custom of inspection of car bodies at loading point.

Therefore, on December 10, 1908, a resolution was adopted by the General Managers' Association of the Southeast, as follows:

"That the entire responsibility for all loss and damage arising from defective car roofs and bodies be centered upon the line loading the car, and that it shall be the duty of said loading line, in order to relieve itself to produce clear and specific proof—not 'usual and customary inspection,' that the defects did not exist at the time the freight was placed in the car.

"And the Chairman is hereby instructed to transmit this resolution to the Freight Claim Association, with request that it be acted upon, and a suitable rule be framed for adoption at their next meeting."

We understand the Freight Claim Association has failed to act on this, even as yet, but at a joint convention of Freight Claim Agents representing three Atlantic seaboard organizations, *i. e.*, the New York Claim Conference, the Southeastern Claim Conference, and the Virginia Claim Conference, to which this committee was invited, this matter came up, and after full discussion, a resolution was unanimously adopted, as follows:

"That it is the sense of these Conferences that, in order to provide an incentive for the more thorough inspection of car bodies, the Rules of the Freight Claim Association should be so amended as to place the burden of responsibility more positively upon the loading line, to show evidence of proper inspection before loading."

End Window.—The Southeastern Claim Conference reported to the General Managers' Association of the Southeast on September 9, 1910, and a recommendation was adopted as follows: "As the end windows afford an easy means of access for thieves, admit rain, cinder and dirt, with consequent damage to certain commodities and to a considerable extent destroys the effectiveness of seal records, it is recommended that the practice of equipping straight box cars with end windows be discontinued, except where the traffic demands otherwise."

Protruding Nails and Bolts.—The Committee on Maintenance and Mechanical Matters of the General Managers' Association of the Southeast made a special examination at Atlanta and Chattanooga as to the number of protruding nails, in cars, with the following result:

	Cars Examined.	Nails Projecting.	Bolts Projecting.	Nails Bent Down.
Atlanta	425	15,362	867	11,929
Chattanooga	305	13,243	286	6,312
Total	730	28,605	1,153	16,241
Average	...	40	1 4/7	25

Of the 13,243 projecting nails found in cars at Chattanooga, 3,518 were found above belt rail and 9,725 below the belt rail. Something like 20 cars were inspected at Chattanooga in one day and it was found that not over five, possibly ten per cent. of the protruding nails had worked out of the cars, the vast majority of them having been used in order to hold lading. In the four corner posts of one car were found 102, 100, 94, and 67 bent down nails, respectively. As a result of the several conferences in the Southeast, most of the lines issued circulars.

Leaky Roofs.—In a report on defective car bodies presented at the October meeting of the General Managers' Association of the Southeast, the statement was made that a great deal of trouble was being experienced on account of leaky roofs, causing damage to merchandise, sugar, flour, cement and other freight subject to damage by water, and an earnest request was made that the railways institute an active campaign to improve condition of roofs, sides and doors of their box-car equipment. In this connection the following record was presented by the St. L. & S. F. purporting to be the result of an investigation showing the condition of car equipment found at their Springfield station platform on a certain day:

Forty-five box cars out of 52 were leaking; 38 cars leaking through the roof and 7 through sides only; a total of 152 roofs leaking with an average of four leaks to each car.

In another report made to the General Managers' Association of the Southeast, January 25, the following data were submitted showing the result of replies received, giving percentage of defective equipment found at certain stations:

It was further reported that for 10 days beginning October 1, the empty box cars passing through a certain division terminal were examined for defective bodies. The result for 702 cars examined is shown at the top of the next column.

Road.	Station.	No. Cars Examined.	No. Cars Leaking.
Atlanta & West Point R. R.	Montgomery, Ala.	60	51
Atlanta Joint Terminals	Atlanta, Ga.	531	33
Atlantic Coast Line	Wilmington, N. C.	43	21
Carolina & Northwestern	Hickory, N. C.	66	52
Carolina, Clinch & Ohio	Johnson City, Tenn.	20	19
Central Georgia Ry	Macon, Ga.	58	29
Georgia R. R.		102	64
Gulf & Ship Island R. R.		....	....
Louisville & Nashville	Birmingham, Ala.	89	9
New Orleans & N.-Eastern.	Meridian, Miss.	1,801	106
New Orleans & N.-Eastern.	New Orleans	1,195	224
St. Louis & San Francisco.	Springfield, Mo.	52	45
South Georgia Ry.	Adel, Ga.	13	4
South Georgia Ry.	Quitman, Ga.	8	5
Tennessee Central Ry.		....	....
Total		4,038	662

Four hundred and sixty-seven or 66 per cent., were found defective (of these 106, or 15 per cent., had leaky roof).

Two hundred and thirty-five, or 34 per cent. were found O. K.

The 467 cars had from 1 to 33 cracks, or openings, in the sides, ends and doors. At Station "A" 1,195 cars were inspected for loading, and 224, or 18.75 per cent. were found with defective roofs, and at Station "B" 1,801 cars were examined and 106, or 5.86 per cent. were found with defective roofs.

In response to a subsequent circular of inquiry sent out by the General Managers' Association of the Southeast, the following was tabulated:

Road.	No. Cars Examined.	No. Cars with Leaks. In Roof.	Elsewhere.	Total No. Cars Defective Bodies.
C. Ga.	136	37	35	72
C. Ga.	289	93	136	229
L. & N.	308	...	...	48
L. & N.	779	...	...	495
L. & N.	325	...	...	189
M. & O.	70	10	33	43
N. & W.	81	32	15	47
N. & S.	105	22	38	60
S. A. L.	148	...	...	51
T. C.	514	120	43	163

While a great many records have been taken in other parts of the country, too voluminous to enumerate, the above will give a very good idea of what is generally found.

Inspection Card.—Another committee recommended the use of a card certifying as to the proper condition of car when furnished for any specific load, and suggested that such cards should cover a more thorough inspection as to the suitability of a car for a given commodity. Furthermore along this line of handling the work, attention was invited to the system in vogue on the Frisco, which had been reported as being very successful in materially reducing the number of claims which they felt satisfied would otherwise have been incurred. The card used by this road is one about 8 in. by 6 in. printed in red.

The use of the card by the Frisco carries with it the understanding between the railways and the mills and other shippers that they must not load a car with flour or mill products until one of the cards is attached to the car, and when car is loaded the card must be removed from the car and turned into the Agent to be attached to the duplicate bill of lading, and the Agents are instructed not to sign bill of lading for flour or mill products until such card is signed by the Inspector or the Agents's representative, if there is no car inspector at the point of loading. This card is then filed in the station record with the duplicate bill of lading, and in event of a damage

Application for car to load _____
(Article.)

Applicant _____

Request Received, Date _____ **Hour** _____

Car placed _____ **Date** _____ **Hour** _____

I hereby certify that car Initial _____ **No.** _____

was placed on date and at hour stated, and was in suitable condition for loading above mentioned article.

Date _____

_____
(Sig. person exm. car.)

Fig. 1—Inspection Card Proposed by the General Managers' Association.

claim being presented, the loading station is asked to produce a copy of the flour inspection card. As pertinent to this, in the year 1911 the Frisco system reports having paid $43,150 for claims directly traceable to defective equipment, which amount was 8½ per cent. of the total loss and damage to freight handled.

The same General Managers' Association suggests the general adoption of a card, somewhat revised, showing that the car has been examined as to its condition before loading, as per Fig. 1.

This form was sent out to the members of the Southeast for criticism, but it has not yet been reported upon.

The Chicago, Milwaukee & St. Paul reported that they have found it profitable to adopt an inspection card certifying to the condition of the car before loading flour, on account of the number of cars that have apparently been loaded at stations before they were put in proper condition for such shipments.

The St. Paul further informs us that they were somewhat surprised at the number of cars reported in unsuitable condition for the loading of such commodities, thinking that their own cars in this traffic were in very fair state of preservation, as many of them were taken directly from the repair tracks for loading; therefore, in order to know how foreign cars were running in this respect a close inspection was instituted which showed that out of 100 cars, 65 were unfit for this class of traffic.

The Chicago, Great Western reports that at Minneapolis, where they handled heavy flour and grain shipments, they have introduced with very good results, a special overhead, as well as interior, inspection of box cars to insure their being in good condition and clean, thus making them suitable for such shipments. Where the floors are somewhat foul and the car otherwise in good condition, the floors are painted over with a quick-drying paint to prevent damage to lading. In the selection of cars for this service extraordinary inspection is made of the superstructure, floor, sides, roof, etc., after which a card is made out by the party making such inspection which is signed by him and turned in as a record of the car being suitable before loading.

Grain Leakage.—In a report on freight loss and damage to the General Managers' Association of the Southeast, March 10, 1910, Mr. Levy explained the method they follow for preventing the leakage of grain, and as it is so much to the point we quote it herewith:

"Through our traffic department, I received a letter from Mr. Christensen, the freight claim agent of the Texas Lines of the M. K. & T., which gave some interesting figures on grain claims. It stated that the Galveston Wharf Company, at Galveston, a port that exports considerable grain, made a test inspection of 7,429 cars of grain unloaded at their elevator, and found that 4,859, or 67 per cent. were leaking grain, and accepting these figures as being correct it is startling information. Of the 4,859 cars found leaking, 2,381, or 40 per cent. were grain-door leaks; 2,478, or 51 per cent. were due to other defects. In thinking these figures over, we felt that if we could devise some method for doing away with the leaking at the grain doors, we could then by one operation, reduce by one-half the number of claims for loss of grain in transit. We made some investigation, and found that while our grain doors cost us in the neighborhood of $1.50 to $2 per car, they do not give us the protection against loss of grain for several reasons: The nails are not always removed from the door post, preventing the grain door from fitting tightly against door post, permitting leakage of small grain between door posts and gain doors. Furthermore the grain doors, which are made in 20-inch sections, 7 feet long, are of unequal strength. The tendency of the weight is to go downward, and to press out at the weakest point, which is the grain door. Sometimes you will find a car where one of the 20-inch sections is bowed out, allowing grain to run through the opening, and when the car is unloaded, the board goes back to its original position, and you have a perfect car, still you are short a number of bushels of grain.

"We made some experiments, and they are satisfactory and we are carrying them further. We purchased eight-ounce burlap in bales of 2,000 yards, which cost us about a fraction over 4 cents a yard. It requires in the neighborhood of fifteen yards to fix up a car in the manner that I will describe, or 60 cents per car. If we had a claim on a car of grain, it would cost us more than 60 cents to investigate it, even though we could escape payment. This burlap is 40 inches wide and we cut it in strips of 8 feet, and after we place the grain doors in the car, we line the grain door on the inside, one section of the burlap extending about 10 or 12 inches to the center of the car floor, the top section lapping over the top of the grain door and over the first section of burlap 18 or 20 inches, so that when the grain bulges, the cloth will draw up, but it will not tear.

"Then the burlap is held in place by small wooden strips, made out of scrap lumber, which are nailed to the car at the angle of the end of the grain doors and the side of the car, making a tight joint between grain door and side of car, and absolutely preventing loss at grain door. In addition to lining the grain doors with burlap, we put a strip of burlap about 3 ft. long over the draft and king bolts, placing a tack in each corner. We require our car inspector to grain door and burlap cars for grain loading, and to show on his grain inspection card, Form 405, that it was grain-doored and burlapped by him. If loaded at a point where there is no car inspectors, we furnish the material to the elevator men and they apply it. When loaded to a point on this line, we instruct agents at destination to return burlap to point of loading. At some elevators they tear out the bottom section of the door, and in so doing mutilate one section of the burlap. We write the agents at destinations of the grain loaded in burlapped cars and ask if there is any leakage, and opinion of consignee of using burlap, and they all report no leakage at grain door, draft or king bolts.

"We feel that 60 cents a car expense is cheap insurance, and we are going to continue that use of the burlap and at the expiration of six months we will be prepared to issue some statistics on both the flour method and the grain method, but we will not get the maximum results unless we can induce other roads to join in something of the same kind."

The committee has in mind the apparent wisdom of going somewhat cautiously and shows here appended in detail its idea as to how it thinks the division might be made; at the same time it does not believe it would be well to attempt for the present to go beyond defining the inspection for the commodities readily damaged by moisture, and for the reason that the rough shipments offered and other shipments carried in box cars might take care of themselves a while longer.

It is also certain that the most earnest and sincere cooperation on the part of all railways is absolutely necessary, otherwise little can be gained though much money might be expended.

In the Twenty-fifth Annual Report of the Interstate Commerce Commission, issued December 20, 1911, it is reported under the heading of Shippers Claims, that—

"From their annual reports to the Commission for the fiscal year ending June 30, 1910, it appears that the interstate steam railway lines during that year paid out the sum of $21,941,232 in settlement of claims presented by shippers for the loss of or damage to their freight in transit. For the fiscal year 1909 the amount paid out on this account was $24,916,830 and for the year 1908 such claims aggregated $27,554,526. The payment for the last mentioned year amounted approximately to 1.6 per cent. of the total freight revenue of the rail lines so reporting to the Commission. For the year 1909 the amount aggregated approximately 1.5 per cent. and for the year 1910, 1.1 per cent. of their total freight revenue. Although it is apparently diminishing in amount, the charge thus made annually against the operating expenses of the rail lines is still substantial enough to be a heavy tax on the transportation of the country.

The method and definitions of inspection the committee is suggesting are as follows:

INSPECTION OF BOX-CAR EQUIPMENT FOR CERTAIN SHIPMENTS NOT OTHERWISE COVERED BY RULES FOR THE TRANSPORTATION OF EXPLOSIVES.

Classification of Equipment for the Following Classes of Freight.

Classification (A)—FREIGHT READILY DAMAGED BY MOISTURE, such as lime, cement, plaster, flour, sugar, boxed, sack and crated packages of seeds, coffee and merchandise, grain, hay, dry goods and notions, high grades of finished lumber, leaf tobacco, furniture and household goods, and certain grades of tin and galvanized iron.

Classification (B)—FREIGHT NOT READILY DAMAGED BY MOISTURE, such as raw wool, baled cotton, crated china, agricultural implements, barreled liquids, hides, shooks (knocked down boxes), wagons, carriages, tools, stoves and stove castings, certain grades of lumber, etc.

Classification (C)—ROUGH FREIGHT, such as coal, coke, brick, pig iron, slate, tiling, earthenware, pipe, ties, barrel staves and other rough lumber.

Method of Inspection Before Loading.

(a) Inspection to be made at point of loading whenever practicable, or,

(b) At point of distribution from which car is forwarded to loading station and again by agent.

(c) Cars received and unloaded at stations where no inspectors are located should be inspected by the agent.

Aside from the Master Car Builders' inspection of car, including roof, running boards, air brakes, safety appliances and running gear, as well as the external inspection of sides, ends, doors, ventilators and windows, an internal inspection

must be made of the roof and siding, with doors, ventilators and windows in closed position:

1. Search for light indicating openings and cracks which might produce leaks.
2. For loose, damaged and broken boards, loose knots, knot holes, bad joints, etc.
3. For all nails and bolts extending above surface of floor and lining and nails protruding through roofing.
4. Search for water stains indicating cracks and air spaces.
5. Search for cracks sufficient to admit storm water beating through opening, also for openings and bad joints around windows and doors.
6. Examine for metal sheets out of position along edge of subcarlins or down from edge of ridge pole.
7. Search for small holes in metal roofs due to rust or small openings in roof from other causes.
8. Doors must operate and close properly.

The floors should be clean, dry and free from defects sufficient to admit moisture, and any fouling by previous shipments, such as fertilizer, oils, and other frieght which would damage more perishable commodities. If the center pin is uncovered it might be necessary to cover it with a piece of board, depending entirely upon the character of freight to be loaded.

Inspect closely for defect in framing which might, by reason of their weakness allow the sheathing being readily broken or damaged.

INSTRUCTIONS.

After car is thoroughly inspected and known to be in good condition and suitable for the transportation of commodities in Classification (A), the Inspector or Agent, as provided for, making such inspection or able to certify to the condition of the car must make out the prescribed certificate of inspection card, marking the same O.K. for (A) classification, as per sample card, shown in Fig. 2.

A B & C Ry.

THIS CAR

No._____ Initial_____

O. K.
FOR
SHIPMENT OF COMMODITIES

Under_____Classification.

Inspected by _____

Date _____191____

Station _____

Fig. 2—Inspection Card for Box Cars.

The certificate of inspection card must be delivered to the Agent before Bill of Lading is issued, and card must be attached to the Agent's office copy of bill of lading or shipping ticket, for future reference in case of question arising as to the condition of car before loading.

The report is signed by:—A. KEARNEY, (N. & W.), chairman; R. E. SMITH, (A. C. L.); L. H. TURNER, (P. & L. E.); W. F. KIESEL, JR., (Penna.), and C. H. OSBORNE, (C. & N. W.).

DISCUSSION.

Mr. Kearney: This is a report of progress. The subject comes to us quite late and the committee did not feel they had been able to cover it sufficiently. We believe if it is so desired to continue the committee and continue this work, we ought to change the personnel of the committee and get into the committee some of the members of the Western lines handling this particular freight that they protect by these cars, and in that way we might be able to get a settlement on a definite form of card, provided it is desired to use a card for material readily damaged by moisture.

The President: This is a matter which deserves a great deal of discussion. I believe we have all had trouble with leaky roofs, and loss and damage due to defective cars, and I would like to hear further discussion on the subject.

F. F. Gaines (C. of Ga.): This is certainly a very valuable and important paper, and I believe if any members of this association will pick out a day when we have a good hard, drifting rain, and go to some good central points of line where we have cars, they will see the results. Now, the majority of the defects that cause these troubles are so small that the average car inspector, in ordinary car inspecting, is not going to find them; and that brings up the point I wish to call your attention to. Who is going to be the proper party to make an inspection of this sort, as to the interior car and its safety and proper condition for labeling? I think it is not one we should not load on our present car inspectors. They have all got their duties, and it is quite impossible for them to make a thorough interior inspection. It seems to me and it would be my suggestion that it would be necessary and desirable for a conference with the American Railway Association along these lines with the idea of relieving the car inspectors from this inspection.

Mr. Brazier: This is a report which comes before our association that hits us more than any other. I wish every member could have been in the arbitration meeting yesterday and heard the joint inspectors of these companies tell us the amount of money it costs to keep up the ordinary repairs under the M. C. B. rules. This grumbling away about repairing cars is a myth, and the sooner we get down to the spending of money on repairs and keep equipment up, the better for us. What I want to impress upon you is: there are many claims to-day paid that should not be paid out of repairs, many more than should be, and many more than are apparent. The condition of equipment to-day in this rush of transportation system is wrong. Our traffic department wants to get business; it is our bread and butter; but at the same time they do not give us time enough to properly inspect the old cars or properly to repair them. And what is the result? On our system in the month of March we had 41 wrecks caused by broken trucks. Why? Some little nut or thing missing. I am just old fashioned enough to believe we will have to come to some rigid way of inspecting; that is, not to allow a nut to pass unless it has something reliable to hold it in place. We have got to do that to protect ourselves. The inspecting is in charge of departments which are held responsible, and at the same time the traffic department is out after business. They want to make fine runs and they are running freight trains to-day like passenger trains; as a result there are too many accidents which are caused by loose inspection. The sooner our management finds out that we must spend more money to keep up equipment, the better it will be for all of us.

I want to offer a resolution that has been handed to me, which hits the nail on the head, and which reads as follows:

"Whereas, for the safe and expeditious movement of traffic, the freight car equipment of this country should be maintained in the highest state of efficiency;

"Resolved, that the Master Car Builders' Association urge upon the American Railway Association, also on the several general managers associations, the necessity for the authorization on the part of the executive officers of the railways, of sufficient expenditures for the maintenance of freight cars as will attain and maintain this efficiency; and be it further,

"Resolved, that for the purpose of immediate procedure, it is recommended that the members of the Master Car Builders' Association as individuals shall urge upon their several corporations, that, in the case of home equipment when placed empty upon shop tracks or repair branches, it shall be placed in condition for M. C. B. interchange; and in the case of foreign cars, authority shall be granted by the owning road to follow a similar plan, or the car returned to the owner immediately for the accomplishment of this purpose."

I believe if our managing officers could realize what this means we would have what we call on our road—running repair men. We require all cars to be put into condition and inspected under the M. C. B. rules; we try to do that; but we repaired a million and a half of cars last year, and yet to-day we are with more than 4 or 5 per cent. of our cars in bad order; and I think that is the way you will find they are running throughout the country, and we cannot keep up with repairs.

It is a disgrace to us car builders to go to the ordinary railway yard and see the condition of doors and doorsteps. I think the manner in which an ordinary wooden doorstop is applied to-day, is a disgrace; as soon as the air-brake is applied, it splits and the door opens. And then the condition of the roofs; they are in terrible condition; and we cannot do anything by talk alone; we must do it by money and work, and I would therefore offer this as a resolution to be adopted.

M. K. Barnum (I. C.): I would like to second Mr. Brazier's resolution. I believe the figures of most railways show that freight cars go onto the repair tracks on about an average of ten times per year, and many are turned out without doing all the work required to put them in first class condition. If all the work that should be done on cars that come to the repair tracks was done, it would be more economical than the present practice, but at first it would require an increased force and a larger expenditure. I know of one road that handles a great deal of flour and cement, and the superintendent of transportation told me that in order to get 25 cars to safely load with

flour and cement, he had to set in from 100 to 125 cars. That is sufficient to show, I maintain, why our cars, particularly box cars, should be kept in the best state of repair; and I don't think we should be afraid to tell our managers that we need more money for this purpose.

Mr. Tatum: Inspection will not repair the car; it will fix it as a candidate for the repair shop. If the inspector, after shopping the car, fails to get it to the repair shop, the value of his inspection is worth nothing to the railway. The repair shop foreman must have sufficient facilities and labor to repair the car. To arrange cars and inspection for cars of various classes of trade, I do not think is a practical arrangement. It may be wise to have your equipment arranged for two classes of freight, especially your box car equipment. You may have a certain portion of it set aside for rough freight, the balance should be arranged to prevent any loss of freight that the transportation department sees fit to load into it. If you fit your cars for the best loading, and your superintendent loads rough freight into it, what is the result? It only makes one trip before it is not fit for the loading it is required for. If you fit your cars up for flour, for cement and for other commodities, and your superintendent loads it with coal, with coke, mine crops and such material as that; is it likely to be fit, after unloading, for the loading it was intended for? It is not. It has to go to the repair shop again. Go through your yards and you will find the ends of the cars broken out; you will find the doors in bad condition. Why? Because it has not had proper attention; it has not been placed on the shop track when it first needed repair. Instead of that, it was allowed to run until it cost 3 or 4 times to repair, than it would if it had been repaired when the defect was light.

We should have our cars equipped with substantial roofs, tight roofs, and substantial ends, that will stand the average service of to-day. They should all be kept in their proper service. But it is a question whether that can be brought about. If it is done, I believe we can keep our equipment in better condition of service than heretofore. It narrows right down to the rule before the association, that we must let our management know the condition of equipment, that we must have facilities to repair, and we must have time to make the repair. I would suggest that this association support the paper that has been submitted.

Mr. Downing: I wanted to talk along the same lines that Mr. Tatum talked; and I think it would be a good idea to let the mechanical department know what percentage of box cars should be maintained for certain freightage. I do not think it is along the line of safety to pick out certain cars for a certain commodity. As Mr. Tatum said, we have cars outlined in this paper, and if we do not maintain our cars at 100 per cent. we are just as liable to find 500 all in a bunch, not fit, and another 500 in some lumber district. In regard to inspection as outlined by Mr. Gaines, the inspector will have to do it; the cars will have to be inspected on arrival at the terminals. If you don't do that they will be switched into the transportation yards at different points. It is up to the inspector to look after that. A man who does not understand construction will only look at the roofs and floors. A good many cars have roofs and floors all right, but they have weak parts somewhere else, and they are not safe to load grain on. Instead of talking about spending a lot of money to equip cars to make them fit for grain, let us spend the money for new cars.

C. E. Swanson (A. T. & S. F.): I want very forcibly to bring out the question of the insecure fastenings of the side door. Mr. Brazier touched on the subject, and it is a very important one to-day. We have cars in good order with good door fastenings that can be entered and pilfered, and the fastening placed back without the seal being disturbed, and further, nobody could tell that it had been pilfered. On our line last month, we had 462 losses on sealed shipments. My attention was especially called to this by a special officer who asked me to go through our shop with him. We went to the shop and sealed for inspection fourteen cars from different roads, and that man entered everyone of those cars without breaking the seal. He did it very quickly, and placed it back so no one could tell that he had been in. These cars were equipped with the old staple with one bolt, and I find a great many of the roads are still maintaining that old iron staple with one bolt. With a bar of iron about 16 in. long, you could easily break that hasp and enter the car. Another thing, the back corners of our doors, not being protected by iron, are soon chewed up so that they can be pressed outward enough for one to enter the car without breaking the seal.

Regarding leaky cars, our management two years ago started a loss and damage committee, which meets twice a year to talk over and apply remedies to prevent the robbing of our treasury unnecessarily, and I believe that the agitation that has been started and the questions that are being discussed in all the organizations will have a beneficial effect. The Secret Service convention meets in Buffalo and this subject of side doors is going to be discussed there. The mechanical department get the blame. The Claim Association is going to take the matter up also, and we will get the blame because the roads will not repair our cars.

Mr. Hennessey: I will move as an amendment that the resolution of the Master Car Builders' Association be referred to the executive committee of this association, and that they in turn refer this discussion, or such part of it as they see fit, to the American Railway Association.

E. T. Millar (B. & M.): I want to confirm what Mr. Brazier has said as to the expense of repairs as compared with the cost of damage, and also what Mr. Swanson has said regarding the entering the cars without breaking the seal. A number of employes on the road I am employed by experimented on this subject. One set of men fastened a door as it should be and another set of men entered the car and put it back in its original condition. In the majority of cases there is no trouble at all to enter the car without anybody knowing, and the car goes through with an unbroken seal. I believe every person connected with this association should do everything he can to get a stronger and more suitable device for their cars. Those things can't be obtained for nothing. We have to pay money for them, and those of us who are lower down will have to talk loud and long to our superiors to get the money for them.

Mr. Kearney: I think we are responsible, and very largely responsible, for our equipment. I am sure I would regret very much to usher our general manager down the line, because I could not defend the condition of the cars; I could not blame him for it and I could not blame them for it: that is, for not giving us the amount of money to spend on equipment, because they would come right back at us and tell us we had recommended a standard as satisfactory to us which was not satisfactory. As a gentleman said a moment ago, we would be blamed for it, and I think it belongs to us; if we do not put the right kind of hasp on, we can't blame the general manager for that. I would not think of telling the management that they did not give us the right kind of hasp. They would tell us we did not know what a hasp was for; but they would also tell us they wanted a car in good condition, and they would accept the car just as soon as we had decided it was satisfactory for service. I think if we would raise our standard for the condition of cars and fix them as we think they should be fixed, and in accordance with our ideas as we have expressed them here, they will very soon back us up. The trouble is, and isn't it a fact, that we pass the cars through the shop to work.

F. H. Stark (Pitts. Coal Co.): I believe the matter should be brought to the attention of the general managers regarding the manner of handling equipment and the large loss sustained through the rough handling of cars, which cannot be measured. Another feature is that we cannot better the condition by making a new resolution and then going home and be governed by the wishes of the individual railways. It would not be practicable to tighten up on the inspection, as a force measure; for the shipping interests of this country would not stand for the return of the old protective system. Consequently, we must adhere to the present system of expediting freight. As to how to force railways to maintain their cars to a better standard, is a question, but it cannot be done by tightening up on inspection. Some 10 years ago I suggested that if the mechanical department did not take the initiative, the transportation authorities would assume control of the interchange of cars, and they are gradually making inroads on our jurisdiction. I suggested at that time that a commission be inaugurated to represent all of the railways in this country, and that inspectors be employed to travel the country over—much as the Interstate Commerce Commission inspectors do. This will enable all roads to delegate to the company having foreign cars in its possession the right to make all the repairs necessary, instead of making partial repairs as is the practice, so long as they maintain the car to standard. If, through these inspectors the owner will be assured that they will be made proper, and that the charges will be made accordingly for the repairs, no one will object to repairs being made at any time and place.

I believe it is coming. The American Railways Association has already taken steps to appoint a commission to look after the proper handling of cars, and the question of interchange and maintenance is equally important. Such a commission could assist in bringing about uniform inspection, proper repairs and billing therefor; also prevent the use of materials not in accord with standard specifications.

E. Chamberlain (N. Y. C.): Mr. Downing, an official of the Lake Shore Road, stands up here and says we cannot maintain an equipment of 100 per cent. efficiency, that is very true; but by the able assistance of the American Railway Association

you can take some steps in that direction. If, upon your repair branches and tracks, when the cars come there, they are put in a perfect condition for M. C. B. interchange, you have accomplished a great part of the proposition. It would be, of course, very desirable to have all the equipment at 200 per cent. of efficiency, but cars would drift away from your inspection points and be apt to be loaded with something you did not want.

Mr. Brazier: My resolution is offered in the best of spirit, and we want to put this thing up to our managers, that we may be authorized to take it up. As to my good friend Mr. Stark, I cannot agree with him. I would like to ask him how it affects the traffic department. We had, week before last, a foreign car break down—one truck—and we had 41 cars delayed by reason of that one break. I can't say that is poor inspection; but you are going to have expense whatever you do. Equipment is going to be the same. Mr. Downing strikes it right; we should wipe out these old cars and get new cars. Mr. Tatum has the right idea. I don't know that it will do us any good to discuss it any more. You all know I am telling the truth, and we should have greater efficiency and more money. Let this go to the executive committee; they in turn can turn it over to the American Railway Association, and they can tell us what to do.

Mr. Hennessey: They talk about tightening up on inspection and that we keep tightening up on inspection. Now, if we only put our cars in proper condition, we will lessen inspection and will not require tightening up. If a car is in proper condition, we have no inspection to make.

D. R. MacBain (L. S. & M. S.): The air of the convention is rather pessimistic to say the least, concerning the car situation. I will agree with a great deal that has been said, but I think we ought to look back a little way and try to see the cost of the low efficiency in the freight car equipment. I think everybody in the room will remember the spirit we had during 1905, 1906 and 1907 when everybody had more business than he could do with the equipment end, and at that time it was an universal thing for everybody throughout the country to do what he could to get his equipment moved. That lasted until 1907, when the panic came, and from that time on we have been in bad condition, from slighting repairs. The trouble was we were forced to keep the car moving just as long as it was safe to run and we went back on the maintenance, and we have not taken hold of that end since as it ought to be taken hold of in order to get back to where we ought to be. I don't think the situation is so disastrously bad as has been stated. As one gentleman said this morning, the greatest difficulty is in the roof and the door. A walk through the big yards will convince anyone that the roof and the door have been neglected. Even the poorest arrangement on the door would do well if it had been maintained; but it had been neglected. Now getting back to the soundest way of treating repairs, the proper thing is to repair the car, not make it fit to run only—as we did at the time we could not do anything else.

Mr. Kearney: That is the thing exactly.

Samuel Lynn (P. & L. E.): Our superintendent of car service called us up and said at a certain point of our line where we had 10 shipments, he had something like 60 cars, and I had the inspectors go over those 60 cars, and we got 4 out of the lot. Now, we are using on our line a system where the inspector passes on the cars that are fit for loading, and the percentage of cars we can use is very small. We find in some cases where we have put cars on, the shipper will turn the cars down because he has a test, and the percentage we pass would probably be cut down 50 per cent. Now, that is in line with what Mr. Stark says.

Mr. Barnum: I want to say if we should only tighten up our inspection there would not be enough serviceable cars left to handle the ordinary business. I presume you have all had the experience, when there was a shortage of cars, of being instructed to have your car inspectors look over the "bad orders" and return to service all that had no penalty defects and were safe to run even though they might have leaky roofs, loose siding and other defects which ought, for their proper maintenance, to be repaired at the time. I have spent a great deal of time in the last 10 or 12 years figuring on who was making their car repairs the cheapest, but have seldom been asked who was keeping their cars in the best condition. The road in the West that is the very lowest in the cost of its car repairs, is also above all others in the way its cars are maintained.

A great deal of the trouble starts with the buying of new cars. The question of side doors has been raised here. We all know the difference between a first class door and one that is not first class is only a matter of a dollar or two a car, but it means $2,000 for 2,000 cars and so the cheap, flimsy door is generally specified.

The President: Gentlemen, you have heard the motion as amended by Mr. Hennessey. The motion was put and carried.

COUPLER AND DRAFT EQUIPMENT.

At the last convention, the committee was instructed to design an M. C. B. coupler and present it to the next convention. The committee was also authorized to take up with the coupler manufacturing companies the subject of redesigning the freight car coupler; to invite representatives of coupler manufacturing companies to join with the committee in designing and adopting one standard freight-car coupler, and to employ, at the expense of the Association, such expert assistance as was found necessary to carry out the work of designing the proposed new coupler, the amount of this expenditure to be subject to the approval of the executive committee. The committee was also instructed to prepare a design regarded as a temporary coupler and submit it to the executive committee.

The committee has made a report on this last item which was adopted by a special letter ballot and is contained in the 1911 Proceedings, pages 513 to 520, inclusive.

STANDARD M. C. B. COUPLER.

Each coupler manufacturer has developed, subject to the restrictions of the M. C. B. Association, one or more couplers based upon his own ideas, but employing certain fundamental

R. L. KLEINE,
Chairman, Committee on Coupler and Draft Equipment.

principles, consequently the couplers thus produced vary in design and it is neither practical to develop a composite design from the ideas and principles thus employed nor even to standardize any of the individual parts. As the service conditions increased or the design or strength of the individual type of coupler proved inefficient, the manufacturers developed other couplers in the effort to keep pace with the conditions imposed, which accounts for the number of types of couplers in existence. The increase in the requirements of M. C. B. Specifications from time to time is directly responsible for some of these later types having been developed and the elimination of many others, the direct result being the reduction of the total number of types in service.

The committee in order to acquaint itself with the different service conditions determined upon a thorough investigation of the performances and failures of the existing couplers so as to determine the limitations of the present M. C. B. coupler and establish a basis upon which to design the standard coupler. To facilitate this work a subcommittee was appointed consisting of representatives of the members of the committee with instructions to review the subject carefully by making an investigation of existing couplers visit roads where trouble is experienced with the present M. C. B. design of coupler and submit recommendations for the design of a standard M. C. B. coupler.

CONTOUR LINE DISTORTION AND COUPLER FAILURES.

The chairman of this subcommittee was directed to correspond with railways in various sections of the country to ascertain whether or not it is general that serious trouble is being

experienced with coupler contour lines being distorted on certain roads having severe grade and curve conditions, especially where the Mallet locomotive is used, and also to learn what difficulties are being experienced in maintaining the present coupler in repairs.

The replies to this circular brought out that there was no more trouble experienced from coupler failures where Mallet locomotives were used than with the consolidation or other types of locomotives and that the coupler failures enumerated below were common on most of the roads predominating where heavy service obtains.

Coupler Head.—Face of coupler cracking and breaking; guard arms spreading and breaking; striking horn crushing in, making lock inoperative; coupler lugs breaking off, starting from the inside; knuckle pin holes in coupler elongating; distorted contour lines, and difficult to couple with slight impact.

Knuckles.—Breaking through pivot pin hole; broken tails; breaking through shank of knuckle; worn knuckles at lock-bearing area, and elongation of pivot pin hole.

Knuckle Pivot Pins.—Breaking and bending.

Locks.—Worn and damaged.

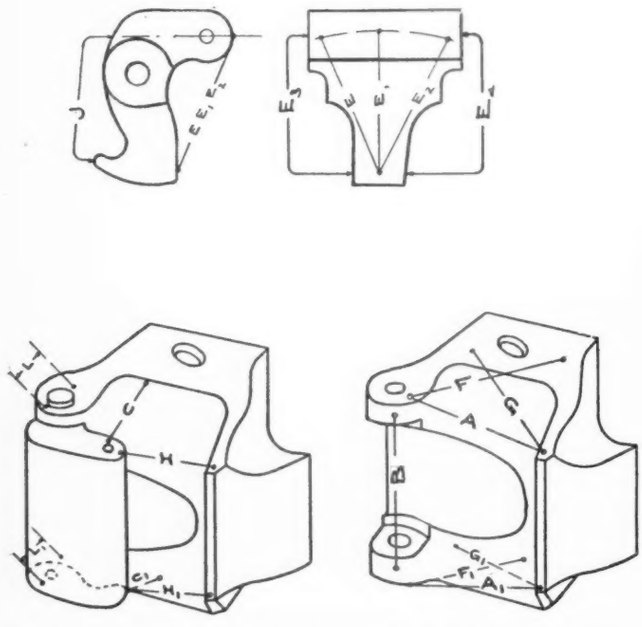
The recommendations contained in the above replies were not very numerous, the most common being as follows: Strengthen the guard arms; increase thickness of front wall; increase size of coupler lugs; strengthen side wall back of lug side of coupler; increase size of knuckle and make pivot pins as large as possible; modify contour lines to provide for increases suggested in above, and increase lock-bearing area.

The subcommittee investigated coupler conditions during the summer and fall months of 1911, visiting several railways, in addition to the roads which they represented.

During their investigation, the common coupler troubles and recommendations heretofore mentioned were kept in mind and thoroughly looked into. Scrap piles were examined, couplers gaged in service and freight trains ridden in order to measure and observe the true action of couplers in service. Records were taken of the broken couplers, knuckles etc., and the gage of couplers in service. The committee has this data at its command to be used in the designing and developing of the standard coupler.

The investigation developed that a large percentage of the coupler contour lines being beyond gage was due to couplers of old design not being maintained and some of the later types being very poorly fitted up when new; knuckle breakages resulting from air-brake troubles on long trains; and guard arm and face failures, due to rough handling of cars in classification. Knuckle-tail failures were common, attributed in many cases to faulty design. It was quite evident that new couplers did not receive the close inspection necessary to insure proper fitting of the detail parts.

Aside from the above, numerous failures of coupler bodies and contained parts forcibly impressed the committee that the couplers should be materially strengthened, and with a view of determining the increased strength required it was considered absolutely essential that the strength of the present coupler should be established.



Tramming Points for New Coupler Tests.

TESTS.

At a meeting of the subcommittee in conjunction with C. D. Young, engineer of tests, Pennsylvania Railroad, a series of static, drop and road service tests was outlined. Heretofore, all coupler and separate knuckle tests have been made by measuring the ultimate distortion after the final blow as prescribed by the M. C. B. specifications, but in the tests now being conducted the distortions are measured after each drop or pull and tabulated by so much plus or minus from the original dimensions, the idea being to establish the point at which permanent set takes place. The location of points, etc., are shown herewith.

During the last several years the process of heat treatment has been given attention with a view toward increasing the tensile strength and elastic limit of cast steel, but couplers have not been experimented with, under this process. Pulling test of the couplers and parts with varying chemistry and treatment are being included in the test program.

The Pennsylvania Railroad has kindly volunteered to conduct all the tests for the committee and they are now under way at Altoona, under the direct supervision of C. D. Young, engineer of tests. These tests, embodying the features mentioned, are being carried out on the following types of 5-in. x 7-in. couplers; Pitt; Janney X; Major; Major Special; Gould Z; Latrobe; Sharon; Krakau; Bazeley; Simplex and Simplex Special. The total number given for test by various roads is 322.

The road tests to be conducted are as follows:

By the Pennsylvania—12 couplers; 2 each of the Pitt, Sharon, Gould Z, Simplex, Major and Latrobe, applied to 100,000-lb. capacity steel hopper cars regularly assigned to the coal trade; 3 Pitt, 3 Sharon, 12 Krakau, 12 Simplex Special and 6 Bazeley couplers applied to steel tenders in freight service. These couplers are to be plate labeled, gaged and trammed before application, and will be followed closely .

By the New York Central & Hudson River—6 Gould Z and 6 Simplex couplers applied to tenders in freight service.

In both cases these tender couplers were furnished by the respective roads.

The following coupler manufacturers were represented at a joint meeting held in Altoona on March 4, 1912: American Steel Foundries; Buckeye Steel Castings Company; Gould Coupler Company; National Malleable Castings Company; Monarch Steel Castings Company, and McConway & Torley Company.

The chairman outlined the position of the committee in regard to the probable procedure, substantially as follows:

"The idea is to design the one standard coupler on the best principle or principles known to the art, to be determined from the fundamentals used in the design of present or past couplers and from our knowledge of their behavior in service, eliminating in the new design the failures and proven mistakes in the old. If this can be done without infringing any existing valid patents it would be an ideal solution, in any event it is the purpose to design the best coupler within our power, then submit it to ascertain whether it contains infringements of any existing valid patents. Should it be found that the coupler thus designed infringes any patents, it is the purpose of this committee to recommend to the Master Car Builders' Association that the owners of any patents involved be given due consideration and settle upon a basis mutually agreed upon between the coupler manufacturers and the M. C. B. coupler committee, so that the standard coupler may be manufactured and purchased in the open market. It is understood that with the design of the standard coupler suitable gages covering the detail parts will also be included as well as specifications in accordance with which the new coupler must be purchased."

The subject of patents, should they be involved in the standard coupler, was taken up by the manufacturers, and at the next joint meeting they presented a tentative proposition, the substance of which was as follows: That all the coupler manufacturers are willing and glad to coöperate with the M. C. B. committee in reference to designing and adopting a standard coupler, and, in order that the work of the committee may be entirely unhampered by any patents of the present coupler manufacturers, the manufacturers have been considering what arrangements could be made between them to this end which would afford to any company owning patents which might be embodied in the coupler selected, proper compensation for the use of these patents as suggested by the committee. The manufacturers had not succeeded in working out the details of such a plan but they believed it could be arranged.

Another joint meeting was held with the coupler manufacturers at Altoona Pa., May 15, 1912, at which propositions were submitted to the committee, which have been referred to the executive committee of the Association.

The coupler manufacturers named representatives to act with the committee in designing and adopting a standard coupler.

M. C. B. STANDARDS.

1. *Location of Lock Lift.*—In answer to recommendations referred to this committee by the committee on standards and recommended practice, the committee would recommend including in the standards the operation of the lock from the bottom in addition to the present top lift, which requires the following changes in the standards:

Page 624, 1911 Proceedings, sixth paragraph, change to read: "That all top-lift couplers must have a 1 1/16 in. eyelet for locking device located immediately above locking pin hole."

Same change to be made in note on Sheet M. C. B. 23.

Page 628, 1911 Proceedings, first paragraph, change to read: "The lock lift must be in the central longit dinal vertical plane of the coupler located between the vertical plane of the striking horn and contour lines, and must operate either from the top or bottom by an upward movement. The total lift of locking pin shall not be more than 6 in."

2. The attention of the committee has been directed to a discrepancy in a dimension shown on Sheet M. C. B. 23. Since the introduction of the 9¼ in. and 12¼ in. heads the distance from the pulling face of knuckle to the buffer block or end sill as now shown on Sheet M. C. B. 23 is only correct for the original 8¾ in. head. As this dimension varies in accordance with the length of head and amount of compression in draft gear it is of no special value, and, therefore, would suggest that the Secretary be authorized to eliminate this dimension from Sheet M. C. B. 23.

In conclusion, the committee desires to express their thanks to the various railways visited by the subcommittee for the courteous treatment accorded and the facilities extended them in making their investigations. The association is also indebted to the railways previously enumerated for the couplers which were donated for test purposes and to the Pennsylvania Railroad in particular for the large number of couplers donated and for the facilities and expert assistance given in testing these couplers.

The report is signed by:—R. L. Kleine (Penna.) chairman; F. W. Brazier (N. Y. C. & H. R.); J. F. De Voy (C. M. & St. P.); Henry La Rue (C. R. I. & P.); F. H Stark (Pitts. Coal Co.); H. C. Trimyer (S. A. L.) and G. W. Wildin (N. Y. N. H. & H.).

Mr. Hennessey: I move that the report be accepted, the committee continued and a proportionate vote of thanks for the work they have put in on this job be tendered to the committee.

The motion was carried.

Mr. Schroyer: I move that the recommendations of the committee in the last part their report be adopted as submitted. The motion was carried.

A report drawn up by the joint committee on Joint Interchange and Inspection Bureaus as presented to the executive committee of the Master Car Builders' Association, and to the Association of Transportation and Car Accounting Officers was distributed to the members for their information.

W. F. KIESEL, JR.,

Chairman, Committee on Springs for Freight Car Trucks.

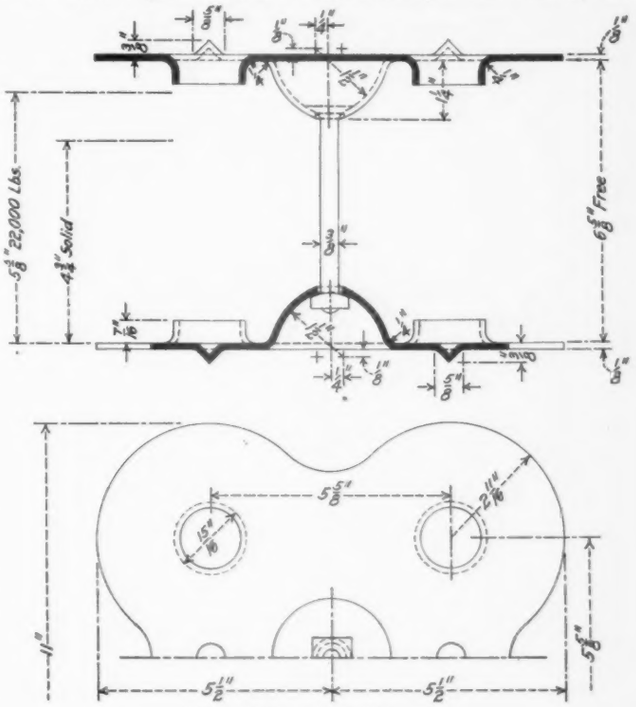
SPRINGS FOR FREIGHT CAR TRUCKS.

The committee in their report of progress states as follows:

Springs now used under freight cars take permanent set, have too little range of deflection, and sometimes break in service. Some manufacturers are preparing to make experiments to develop a scheme involving the use of more reliable material and more uniform temper, but to date these experiments have not progressed sufficiently far for positive recommendations.

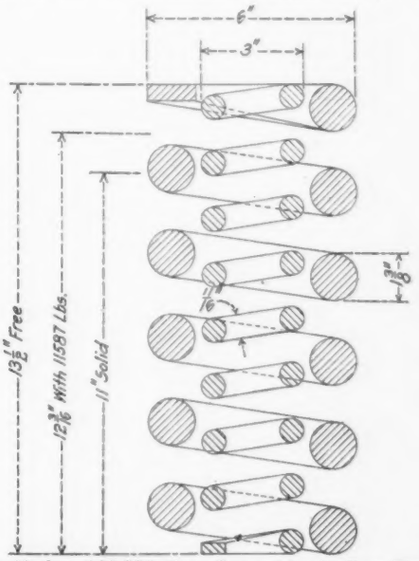
The indications are that relief will be obtained by heat treatment of steel and careful tempering, which will permit the use of higher allowable stresses when springs are compressed solid.

The steel at present used has about one per cent. carbon, and



New Type of Spring Cap.

when springs are compressed solid the stress is between 80,000 and 85,000 lbs. per sq. in. With carefully tempered, heat-treated steel, this stress can be increased to 100,000 lbs. per sq. in., and



Spring H for 140,000 lbs. Cars (Arch Bar Trucks).

Two bars, 1st bar 1⅝ in. dia. 116¼ in. long, tapered to 123½ in. 2nd bar 11/16 in. 116¼ in. long, tapered to 119⅞ in.

Normal wt. 1st bar 48 lbs. 12 oz., minimum wt. 47 lbs. 5 oz. 2nd bar 12 lbs. 3 oz., minimum wt. 11 lbs. 13 oz.

Outside dia. 1st coil 6 in., 2nd coil 3 in.

Heights, 1st coil 13½ in. free, 11 in. solid, 12 3/16 in. 9270 lbs., capy. 17636 lbs. Heights, 2nd coil 13½ in. free, 11 in. solid 12 3/16 in. 2317 lbs., capy. 4414 lbs.

Cluster of Springs. Heights, 13½ in. free, 11 in. solid, 12 3/16 in. 11587 lbs., capy. 22070 lbs.

possibly to 120,000 lbs. per sq. in. without producing permanent set or breakage, and the resultant decrease in diameter of wire will give a greater range of deflection within the limited space now available in trucks. Better tempering of the steel now used can be obtained, and should be required. To avoid obtaining the springs either too hard or too soft, a specification for physical test is necessary.

Attention was directed to the impossibility of making the spring caps, shown on Sheet H, of ⅛-in. material without change in the central depression. In view of the situation, the committee recommends that no changes be made at this time in the design of the springs, and that the design of the spring caps be modified, as shown herewith.

[The modified spring cap of Spring *A* is shown herewith as an example of the changes which have been made.—EDITOR.]

The committee desires that it be furnished with the dimensions of available space, or preferably prints of springs, which have been designed for 140,000 lbs. capacity cars, for consideration in connection with making an M. C. B. design for such springs. As an example, an illustration of a spring used for that purpose is shown.

These can be used either with or without spring caps.

It is also recommended that before assembling the springs they should meet the following physical test:

1. Every coil of each spring must be compressed solid with shock not less than six times.
2. At least 10 per cent. of each kind of coils must be weighed and measured.
3. The weight of each coil must not be less than the minimum weight specified.
4. The outside diameter of coil must not vary more than 1-16 in. above or below the given dimension.
5. The free height must not exceed, but may be less than the given dimension.
6. The load height must not be less than, but may exceed the given dimension.
7. If any coil of the 10 per cent. selected does not meet these requirements, all coils of the same kind must be checked, and those which do not meet the requirements for weight and dimensions must be rejected.

The committee believes that the adoption of these preliminarv rules will tend to give some relief from spring troubles, pending the development of better material and tempering.

The report is signed by:—W. F. Kiesel, Jr. (Penna.), chairman; T. A. Lawes (N. Y. C. & St. L.); J. R. Onderdonk (B. & O.) and J. Hainen (So. Ry.)

The report was accepted and the recommendations referred to letter ballot.

TRAIN LIGHTING.

The committee has gone over carefully the suggestions as to recommended practices given in the report to the 1911 convention, and have also given careful consideration to the various points as brought out by the committee on standards of the Association of Railway Electrical Engineers at their 1911 convention, and desire to change our suggestions as to recommended practices given in our report of 1911 to read as follows:

GENERAL.

1. That in electrically lighted cars the following voltages should be used:

60 volts (nominal) for straight storage, head-end and axle-dynamo systems.
30 volts (nominal) for straight-storage and axle-dynamo systems.

2. That each electrically lighted car be provided with a notice giving the following information, and that this notice shall be posted in the switchboard locker:

*System.
Type of generator.
Type of regulator.
Voltage of system.
Ampere hours capacity of battery at 8-hour rate.
Number of sets of battery in parallel.
Nominal charging rate ..... amps. ..... max. amps.
Size of train line wires—B. & S.
Number of train line wires — (2 or 3).
Capacity of generator ..... amps.
Axle pulley ..... in. diam.
Generator pulley ..... in. diam.
Length of belt ..... ft. ..... in.
Wiring diagram (show location and capacity of fuses).

*State whether axle dynamo, straight storage, and if used on head-end system.

3. That the rules of fire underwriters shall cover all car wiring.

4. That all wiring under car to the switchboard shall be run in conduits.

5. Standard lamps for car-lighting service should be in accordance with dimensions as shown on Exhibit I.

6. That where train-line connectors are used, a connector having dimensions as shown on Exhibit A shall be used and located as previously shown. If only two wires are used they shall be connected to the outside terminals and the female connector on each end of the car shall be stenciled: "Not for use on head-end system."

7. That each electrically lighted car equipped with batteries shall be provided with two charging receptacles with swivel supports, as shown in the details on Exhibits B, C and D, installed one on each side of the car, as shown on Exhibit E, the outside annular ring to be the positive.

Control and Protection of Parts.

8. That each electrically lighted car shall be provided with a switchboard upon which shall be mounted switches, fused switches or terminals. The switches, fuses or terminals to protect and completely disconnect the following parts: Train line; battery; axle dynamo, and circuits for lamps, fans, etc.

The axle-dynamo terminals to control the positive and negative armatures and the positive field of the dynamo. Each of the above switches, fuses or terminals to be plainly marked, designating the part controlled, the positive terminal to be on the right side facing the board.

9. Where a main lamp switch is used, or where fuses controlling all lamps are used, they shall be so stenciled in plain letters.

10. The switchboard or regulator panels of electrically lighted cars shall be provided with fuses for the protection of the parts given below and with the type of terminals as specified.

Train Line.—Terminals for reception of flat fuses shall be provided 2½ in. between centers; stud or screw to be —— in. diam., with —— threads per in.

Battery.—Optional. Fuse terminals, if used, shall be same as for train line.

Main Line Switch.—Optional. Fuse terminals, if used, shall be same as for train line.

Circuits.—For lamps, fans, etc., fuse shall be of the Edison screw-shell type for both opisitve and negative.

Axle Generator.—Positive armature fuse terminal; terminals to have N. E. C. code standard 150 amperes knife blade contact clips mounted with 4-in. clearance between clips. Negative armature fuse terminal optional. If used, terminal shall be same as positive. Positive field optional. If used, to have ferrule type clip mounted with 1-in. clear space between clips and to take N. E. C. code standard, 0 to 30 amperes.

NOTE.—Capacity of fuses, as designated above, to be such as to properly protect the parts in question.

11. That each electrically lighted car equipped with battery box or boxes shall have provided a fuse block, mounted in a suitable metal box at the positive and negative terminals of each set of batteries, and that the fuse block shall be in accordance with the detail as shown on Exhibit F, and installed on the car substantially as shown on Exhibit E. Knife-blade fuses shall be provided with a capacity of between 101 and 200 amperes.

12. That where axle dynamos are used, negative, positive and dynamo field shall be fused as close as possible to the dynamo and prior to the said leads either entering the conduits or being secured to the bottom of the car. The above fuses to be used for emergency service only and to be at least one hundred per cent. above the capacity of the fuses on the switchboards protecting the same leads.

13. All wires or terminals must be marked for identification.

Batteries.

14. That batteries as a set shall be connected up with a positive pole to the right, facing the car.

15. Where lead storage batteries are used they shall be preferably installed in double compartment tanks substantially as shown on Exhibits G, H and I.

16. That where double compartment tanks are used, the connections and arrangements of battery terminals are to be as previously indicated.

17. Battery boxes shall have provided in each door a vent, substantially as shown on Exhibit K.

Axle Dynamo.

18. That a straight pulley seat be provided for the axle pulley. That if a bushing or sleeve be used it should preferably be secured to the axle, independent of the pulley. Bushing to have an external diameter of 7½ in. and to be 8½ in. long, turned straight. That the pulley hub have a uniform internal diameter of 7½ in., the length of the hub to be 6½ in., the face of the pulley to be 9 in. or wider if flangeless, and 8 in. if flanged. That the generator pulley be flanged, crowned and perforated, and have a 7-in. face.

19. That when facing the end of the truck on which axle

generator is mounted, the pulley or sprocket shall be on the right-hand side.

In the above the following changes have been made from the recommended practices as given at the 1911 convention:

The information originally shown on Exhibit A has been incorporated in the body of the report and the following items added to recommended practice:

Item No. 2—Type of generator. Type of generator. Voltage in place of number of cells and series. Size of train-line wires. Number of train-line wires. Capacity of generator. Length of belt.

The following items being omitted: Cut in voltage. Amperes no light. Amperes full light.

Item No. 5—Added.

Item No. 6—The principal dimensions of Gibbs No. 3-G train-line connector have been shown on Exhibit A, and reference to the specific type of connector omitted from the body of the report.

Item No. 8—Item D, covering circuits for lamps, fans, etc., has been added and the reading slightly changed.

Item No. 10—Details covering type of fuse terminals have been given.

Item No. 11—Item has been changed so as to provide for a fuse at the positive and negative terminals of each set of batteries and fuses specified with a capacity of between 101 and 200 amperes in place of 150 amperes.

Item No. 13—Added.

Item No. 14—The words "as a set" have been added after the word "batteries," first line.

Item No. 15—Has been changed so as to cover only lead batteries.

Item No. 17—The word "substantially" added.

Item No. 18—The word "preferably" has been added in the second sentence.

Exhibit A—Canceled, the information being shown in the body of report and new Exhibit A made showing principal dimensions of recommended train-line connector.

Exhibit E—Detail of fuse box crossed off; dimension of center line of charging receptacle to the needle beam omitted. Sketch added showing arrangement of fuses with two batteries in parallel.

Exhibit F—Detail of fuse box removed, showing only details of fuse block and clip.

Exhibit G—Detail of battery terminal connectors omitted. Hole omitted at handle plate.

Exhibit H—Detail dimensions of plates slightly changed. Redesign of bridges shown.

Exhibit I—Detail of handle changed and detail of battery terminals omitted.

Exhibit K—Part of note covering application of copper screen to vent, cut out.

Exhibit L—Standard train-line lamps added.

In addition to the above report on recommended practices the committee desires to make the following suggestions to the Association for consideration:

(1) The adoption of standard size straight axles for different journal sizes for use with axle dynamos. This in view of the adoption of the axle device throughout the country, and the fact that with the present standard tapered axle it is very difficult to properly secure the axle pulley or bushing. The straight axle would result in less maintenance cost in axle pulleys and belts and improvements in service. A number of roads have adopted the straight axle, and if this practice spreads, the diameter of the axle should be standardized in order to minimize the different sizes of bushings or pulleys for car-lighting equipment.

(2) The design and adoption of standard arrangement of axle-dynamo suspension; the axle-dynamo people arranging to provide necessary lugs so that their dynamos will be applicable to the M. C. B. standard suspension. This suggestion is made in order that a safe suspension may be provided for all equipment and that the generators as manufactured by the various manufacturers will be interchangeable.

(3) If the train-lighting committee is continued, the committee would like to be advised as to whether or not it is desired that they include in their investigation recommended practices as to maintenance and repairs of batteries and other electric-car lighting apparatus, and maintenance and repairs of axle generators.

The report is signed by:—T. R. Cook, (Penna.), chairman; C. A. Brandt, (C. C. C. & St. L.); Ward Barnum, (L. & N.); J. H. Davis, (B. & O.); E. A. Benson, (Pullman Co.); D. J. Cartwright, (L. V.), and E. W. Jansen, (I. C.).

Mr. Cook presented the report, and at its conclusion said:

I would suggest that the natural way to deal with this report would be to consider first, the body of the report, as to whether it should be submitted to recommended practice, and second, to consider the suggestions offered by the committee in the last part of the report.

DISCUSSION.

C. A. Seley (C. R. I. & P.): I am of the opinion that this report is a very good compendium of train lighting practice, and represents a very large amount of very intelligent effort, I believe, on the part of the committee, not only this year, but on the part of the committee's preceding years. I would move the adoption of the report, and couple with that motion that it be sent to letter ballot, except the three suggestions, which should be referred to the executive committee.

R. L. Kleine (Penn.): I would like to amend Mr. Seley's motion, by providing that the report be referred to letter ballot by items. There are possibly some detail objections to some portions of the report, and if we refer it as a whole, we will not secure such a good result in the vote as if we refer it by items, in which event we will get the benefit of such items as may carry.

D. J. Cartwright (L. V.): Last year this report was practically submitted to a vote *Yes* or *No*. The result was that we got no definite action except that the thing was thrown out. This year we would like to have each separate item voted upon in the letter ballot, and then we will have something to work on.

Mr. Seley's motion was carried as amended.

SUPERHEATERS APPLIED TO OLD ENGINES.

That the application of superheaters to old or existing locomotives is an economical practice, is demonstrated by the fact that more than one thousand superheaters have been installed in old locomotives during the past year. The economies obtained by this practice have proved that the application of the fire tube superheaters furnishing highly superheated steam to old engines is no longer dependent upon the time of the application of new fireboxes and flue sheets, but upon the time that the engine can be spared from service long enough for the installation of the superheater.

Many of the largest railways are at the present scrapping serviceable flue sheets for the purpose of applying superheaters to their existing power and are installing superheaters on old engines in allotments each month, as the engines pass through the shop for a general overhauling. The loss sustained by the practice of throwing away serviceable flue sheets is more than compensated for by the economy in fuel obtained by the superheater locomotive. Of course, in instances where the flue sheets are to be scrapped away, the cost of the application of the superheater is greatly reduced.

The application of the fire tube superheater may be made to any of the existing types of locomotives, provided only that they are equipped with piston valves. There are many locomotives in this country filling the requirements as far as piston valves are concerned that were built several years ago and are deficient in boiler capacity. It is not possible to haul the tonnage with these engines that the cylinders and adhesive weight should permit because of the inability of the boiler to furnish steam. The use of highly superheated steam in these engines invariably overcomes the difficulty and makes it possible to increase the diameter of the cylinders, providing the weight on drivers is sufficient and the running gear is strong enough to take care of the increased piston thrusts.

Another important feature in the application of superheaters to old locomotives is the fact that the life of the boiler may be prolonged without reducing the rating of the engine or decreasing its capacity as a dividend earner. It becomes necessary, often times, on account of the age of a boiler, to reduce the pressure in order to insure safety in operation. In many instances where it has been found necessary to reduce the boiler pressure, fire tube superheaters have been advantageously applied and by increasing the diameter of the cylinders the original tractive effort of the engine has been maintained and in some instances has been increased. With the application of the superheater

to these old engines they have invariably operated with a marked increased economy in coal and water. Where it has been found impossible to increase the size of the cylinders on account of the thinness of the walls new cylinders have been applied and the economy has been sufficient to cover the cost of the application of the superheater and the new cylinders within one year.

Added to these features which make it economical to apply superheaters to old or existing engines, is the fact that almost invariably when engines have been equipped with superheaters their rating has been increased in some instances this increase has been as much as 20 per cent. which makes the locomotive a better investment from the standpoint of a revenue earner.

CAR WHEEL REPORT.

An error was made in Fig. 8 in the committee report on car wheels, as published in the DAILY RAILWAY AGE GAZETTE, June 13, page 1316. The height of the lug on the tire should have been 1¼ in. instead of 1¾ in. as shown.

AN APOLOGY TO THE WESTERN BALL PLAYERS.

The Daily owes an humble apology to the Western base ball players, and hereby makes it. Stanley Midgly calls attention to the fact that the item in yesterday's Daily, giving the results of past games, credited the East with having won last year and with having won four of the seven that have been played between East and West. The fact is, that the West won last year, 12 to 11, and that it is the West that has won four games out of seven. It was a hard fought battle in 1911, and the annals of the conventions as recorded in these columns should not mislead future generations as to this important matter. The East hopes to get revenge this year for last year's defeat; but the West manifests no inclination to yield up the pennant.

NOMINATIONS FOR SUPPLY ASSOCIATION OFFICERS.

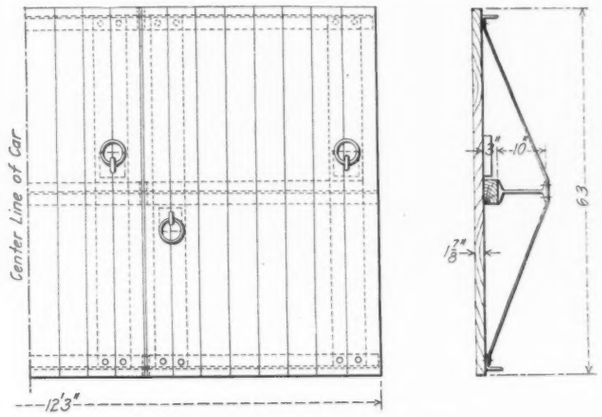
The Nominating Committee of the Railway Supply Manufacturers' Association has nominated the following for the coming year: For President, Samuel G. Allen, Franklin Railway Supply Co.; for Vice President, B. A. Hegeman, Jr., United States Metal & Manufacturing Co.

M. C. B. OBITUARY COMMITTEE.

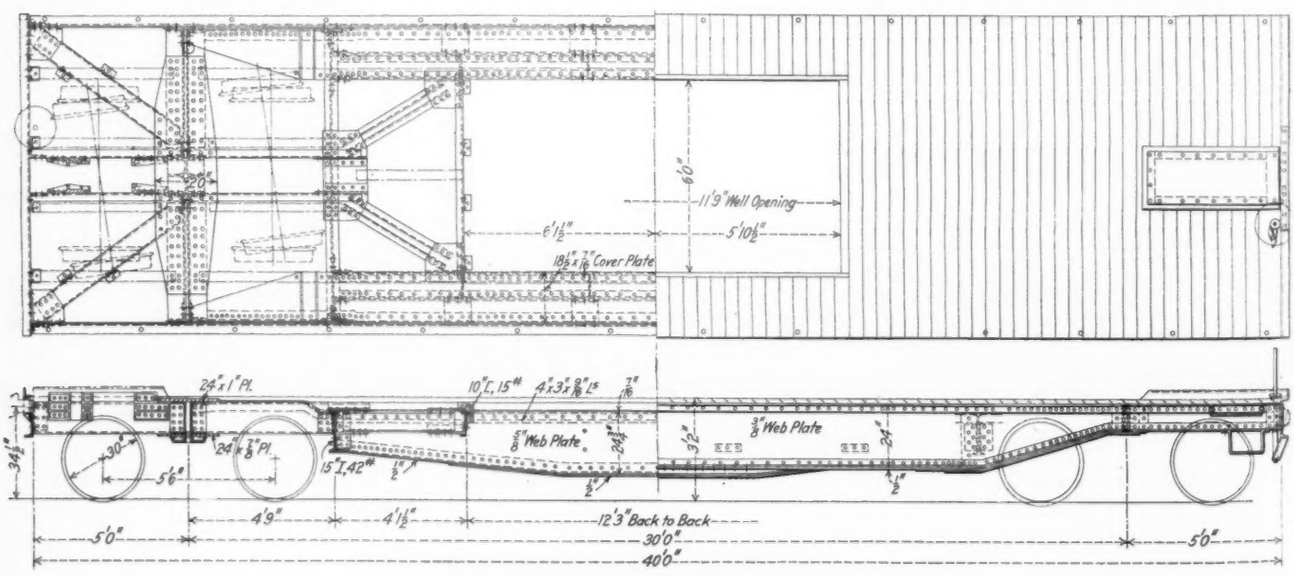
President Stewart of the M. C. B. Association has appointed the following members as Obituary Committee in relation to the deaths of the members named: For Julius Krause (Penna.), R. L. Kleine; for E. Fisher (T. H. & B.), J. Christopher; for W. H. Lungren (P. B. & W.), J. Milliken; for J. F. Mann (P. M.), W. H. Rourk; for G. T. DeVilbiss (H. V.), M. A. Kinney; for F. H. Scheffer (N. C. & St. L.), A. G. Kautman; for R. N. Durborow (Penna.), J. T. Wallis; for G. W. Dixon (Pitts., Lisbon & Western), J. W. Taylor; and for R. F. McKenna (D. L. & W.), H. C. Manchester.

WELL CAR OF 75 TONS CAPACITY.

The Erie Railroad has recently received from the American Car & Foundry Company, New York, six steel well cars of 150,000 lbs. capacity. These cars were built at the Berwick, Pa., shops from the car builder's designs they are 40 ft. 6-3/16 in. in length over the end sills and weigh 49,300 lbs. They have a well opening of 11 ft. 9 in. in length and 6 ft. in width. The side sills are built up of a ⅜ in. web plate reinforced at the top and bottom, both inside and outside, by 4 in. x 3 in. x ½ in. rolled steel angles. A built up side girder extends just inside the side sill and is connected at each end to a 15-in., 42-lb. I-beam crosstie, which extends across the car from side sill to side sill. This side girder is built up of two 5/16 in. web plates, each being



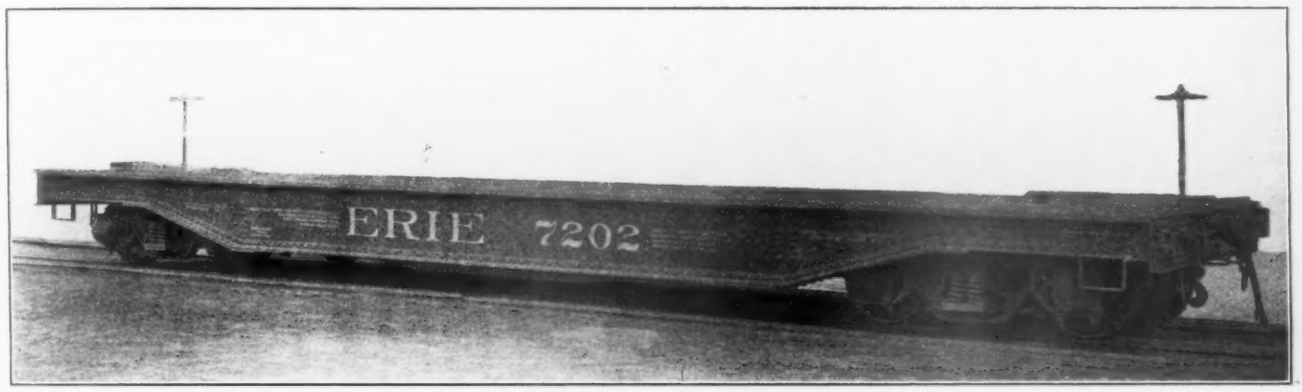
Well Cover for Erie Well Car.



Elevation and Plan of 75-Ton Well Car.

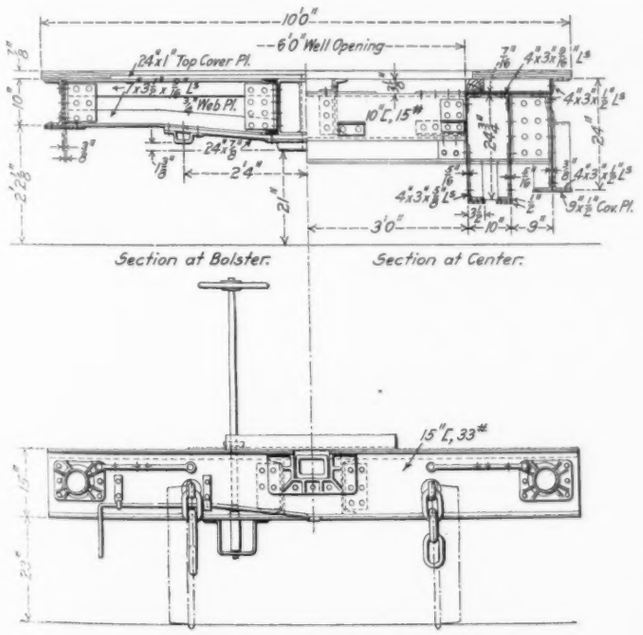
reinforced at the top by a 4 in. x 3 in. x 9/16 in. angle and a 7/16 in. cover plate, which is also secured to the side sill inside top angle. The bottom of the side girder is reinforced by 4 in. x 3 in. x 5/8 in. angles which are secured to the inside of the web plate. The draft sills consist of two 12-in., 25-lb. steel channels and extend from the end sill through the bolster to the crosstie, and a 15-in., 33-lb. channel is used for the end sill. The body bolster is built up of a 3/4-in. web plate with 7 in. x 3½ in. x 9/16 in. angles at the top and bottom and on both sides of the web, with top and bottom cover plates. Two diagonal braces consisting of two 8-in. 13.75-lb. channels placed back to back extend between the crosstie and the well end member. They are tied to the well end member and to the crosstie by gusset plates. The well end member is a 10-in., 15-lb. channel.

The well cover is made up of a 10-in., 25-lb. I-beam center



75-Ton Well Car; Erie Railroad.

member secured by 1/4 in. steel plate straps to two 3/12 in. x 3 in. x 3/8 in. angle side members. The flooring on the well cover and on the car is of wood. Among the specialties applied to these cars are the Miner friction draft gear,



Underframe Sections of 75-Ton Well Car.

the Sharon couplers and the New York air brake. The trucks upon which the cars are mounted are equipped with the Andrews cast steel side frames and bolster and have a capacity of 150,000 lbs.

M. C. B. REGISTRATION.

Appler, A. B., M. E., Del. & Hudson Co., Marlborough-Blenheim.
Barry, J. J., M. M., Norfolk & Western R. R., Raymond.
Bawden, Wm., Wiggins Ferry Co., Watkins.
Cartwright David J., Elec. Engr., Lehigh Valley Ry.
Connor, J. T., M. C. B., 816 Sanjacinto St.
Dow, Geo. N., G. M. I., L. S. & M. S. Ry., Chalfonte.
Gibbs, A. W., C. M. E., Penna. R. R., Chelsea.
Gray, G. M., S. M. P., Bessemer & Lake Erie R. R.
Grewe, H. F., Wabash, Pittsburgh Terminal Ry., Richmond.
Grove P. L., A. E. M. P., Penna. R. R. Co., Chalfonte.
Hayward H. S., Consulting Engr., West Jersey Sea Shore R. R., Chalfonte.
Henry, J. M., M. M., Penna. R. R., Chalfonte.
Jansen, E. W., Elec. Engr., Ill. Central R. R., Dennis.
Keiser, C. B., M. M., Penna. R. R. (Penna. Term. & Tunnel Div.), Traymore.
Kendig, R. R., C. M. E., N. Y. Cen. Lines, Marlborough-Blenheim.
Knox, W. J., M. E., Buff., Roch. & Pitts. Ry.
Libby, J. E., Swift Refr. Transit Co., Traymore.
Meloy, H. C., Chief Electrician, L. S. & M. S. Ry., Traymore.
Mengel, John C., M. M., Penna. R. R. Co., Chalfonte.
Meredith, H. P., Penna. R. R., Chalfonte.
Monfee, A. J., S. M., B. S. R. R., Young's.
Nelson, E. D., Penna. R. R. Co., Strand.
Ott, William B. Asst. Engr. M. P., Penna. R. R. Co., Chalfonte.
Parks, R. H., M. C. B., Merchants' Despatch Transportation Co., Chalfonte.
Shoemaker, C. A., German-American Car Lines, Haddon Hall.
Smith, Benjamin T., Gen'l Foreman, W. J. & S. S. R. R.
Smith, Henry J., Gen'l Car Insp., D. L. & W. R., Monticello.
Spoor, C. E., M. C. B., Buffalo & Susquehanna R. R., Haddon Hall.
Stillwagon, Geo. W., M. C. B., Pitts., Shawmut & Northern Ry., Lexington.
Thomas F. H., V. P. & Gen. Mgr., Bellefont Central R. R., Craig Hall.
Vincent, M. M., G. M., National Car Lines, Traymore.
Walsh, F. J., M. M., Chesapeake & Ohio Ry., Marlborough-Blenheim.

M. C. B. GUESTS.

Adams, J. W., B. & O., Lexington.
Albers, L. H., Supr. Air Brake, N. Y. Central, Francis.
Allcroft, A. E., Clk. Pur. Dept., Penna. Lines West, 12 South Arkansas Ave.
Anderson, J. B, Penna. R. R., Pgh. Div., Runnymede.
Andrewcetti, Joseph Asst. Elec. Eng., C. & N. W., Dennis.
Baker, G. T., Foreman Car Shops, P. R. R., Worthington.
Barrett, W. M., Adams Ex. Co., Marlborough-Blenheim.
Bates, R., West Jersey & Seashore R. R. Co.
Best, J. I., Ch. Clerk Motive Power Dept., P. & R., Dennis.
Blackburn, R., Erie.
Bloxham, Chas. M., Union Tank Line, Cheltenham Revere.
Posworth, W. M., M. E., Kansas City Southern, Raleigh.
Brogan, J. P., D., L. & W., Schlitz.
Bromley, Joseph, Supt. Safety Appli., Interstate Commerce Commission, Monticello.

Brown, B. S., Draftsman M. E. Office, P. R. R., Hotel Kenderton.
Chambers, Andrew, Engr., P. R. R.
Chestnut, Jas., P. R. R.
Childress, B. F., Young's.
Crysler, P. A., Asst. M. C. B., Canadian Pacific, Shelburne.
Currier, H. C., Chf. Clerk Pur. Dept., M. C. R. R. Co., Shelburne.
Davis, H. E., Gang Leader, Penna. R. R.
Davis, W. E., Foreman Nice Shop, Penna. R. R.
Dickinson, W. J., Pullman Co., Shelburne.
Dobson, F. L., M. P. Inspector, P. R. R., Chalfonte.
Dolan, J. C., Pur. Agt. Office, Denver & Rio Grande R. R., Arlington.
Donahue, C. M., P. R. R., Chalfonte.
Downs, M. D., Penna. R. R. Co. (Hudson Div.), Haddon Hall.
Drayer, U. S., Penna. R. R. Co.
Duffy, A. F., Interstate Commerce Comm., Monticello.
Eliot, H. H., Jr., P. R. R., Haddon Hall.
Elliott, Edward O. P. & R.
Eyler, J. W., American Ice Co., Raymond.
Formwalt, F. E., P. R. R., Seaside.
Fosnot, G. N., Cumberland Valley, Chalfonte.
Foster, Lewis, West Jersey & Seashore R. R. Co.
Fox, Geo., N. Y. C., Pennhurst.
Frame, R. E., Haskell & Barker Car Co., Gladstone.
Frost, F. R., A. T. & S. F., Dennis.
Garber, F. M., Baltimore & Ohio, Harmony House.
Garey, Martin, L. & H., Benton.
Gatshall, H. M., Northern Central, Ellwood.
Geisking, C., P. R. R., Seaside.
Gill, John, Young's.
Gracie, A. M., P. R. R., Ellwood.
Hassler, H. G., P. R. R., Young's.
Johnson, J. C., Penna.
Jones, G. R., N. Y. C. & H. R. R., Chalfonte.
Jones, W. F., N. Y. C. & H. R. R. R., Chalfonte
Jones, W. L., N. Y. C. & H. R. R. R., Chalfonte.
Kauffman, D. A., Penna. R. R., Worthington.
Keen, C. J., American Rys.
Kern, W., B. & O. R. R.
Kidd, C. M., Norfolk & Western, Raymond.
Kincaid, B. M., Penna. R. R., Malatesta.
Lamerding, F. A., P. R. R., Haddon Hall.
Leet, W. B., P. Ry.
Leslie, R. J., P. R. R., Seaside.
Lyon, A. N., K. & M., Haddon Hall.
McCarthy, J. H., P. R. R., Young's.
McDonald, M. S., C. & O., Marlborough-Blenheim.
McGary, A., N. Y. C. & H., Young's.
Markland, W. H., Penna. R. R., Seaside.
Metz, Cecil, P. R. R., Haddon Hall.
Middleton, J. A., Lehigh Valley.
Millen, Thos. C.
Minowa, E., South Manchuria Ry., Marlborough-Blenheim.
Mooney, T. H., Sunset Central Lines, Lexington.
Morris, W. M., P. R. R.
Muchnic, Charles M., American Loco. Co., Marlborough-Blenheim.
Murray, John A., D. L. & W.
Newbury, E. H., P. R. R., Lexington.
Newland, Lewis, N. Y., N. H. & H., Wadsworth.
Norberg, A., Pittsburgh & Susquehanna R. R., The Edna Cottage.
Ogilvie, Jas., Board of Ry. Commissioners, Dunlop.
Ozawa, N., South Manchuria Ry., Traymore.
Paxton, C. M., Scranton Ry., Chalfonte.
Pease, O. D. A., Penna. R. R., Young's.
Pendergrast, A. P., B. & O. R. R., Shelburne.
Phetteplace, L. H., C. C. & O. Ry., Haddon Hall.
Potts, John D., Ches. & Ohio Ry., Shelburne.
Powers, M. J., Denver & Rio Grande R. R., Arlington.
Pries, Herman, Haskell & Barker Car Co., Gladstone.
Purt, A. F., P. R. R., Boscobel.
Quinn, C. H., Norfolk & Western, Traymore.
Rafter, E. L., P. R. R.
Reeve, W. K., N. Y. C. & H. R.
Rice, W. L., P. & R. Ry., Monticello.
Riley, P. C., Penna. R. R., Malatesta.
Sandman, A. G., B. & O. R. R., Haddon Hall.
Sheldon, F. R., N. Y., N. H. & H., Wadworths.
Smock, F. A., Penna., Chalfonte.
Stevens, Geo. W., C. & O. Ry., Shelburne.
Stewart, H. A., Armour Car Lines, Marlborough-Blenheim.
Thayer, C. H., Penna. R. R., Ellwood.
Thomas, Francis, Bellefonte Central, Craig Hall.
Totten, E. C., N. Y. C., Pennhurst.
Trigs, J. H., P., B. & W., Wellsborough.
Wahl, Geo., D., L. & W., Schlitz.
Wallace, F. C., Erie.
Wallace, J. E., Wilmington & Southern Tract. Co., Haddon Hall.
Walsh, E. J., Pitts. Coal Co., Shelburne.
Walther, G. C., Penna. R. R., Young's.
Watkins, G. H., Penna., Chalfonte.
Whittaker, F. M., C. & O., Shelburne.
Wightman, D. A., Shelburne.
Wine, W. E., A. C. L., Young's.
Wintroop, Wm., P., B. & W., Wellsborough.
Woolwine, Emory, Virginia, Continental.
Wray, R. W., Penna. R. R., Craig Hall.
Wynn, F. S., Southern Ry. Co., Traymore.

THE M. C. B. DANCE.

The dance last night, though lacking the spectacular features of the balls of previous years proved most popular. It seemed that the floor was as filled as last year, and one noted no difference in the number of ladies who were present. The informal character of the affair, particularly noticeable through the omission of the grand march, was further emphasized by the members of the Entertainment Committee wearing business clothes, their example being followed by many others.

FOREIGN RAILWAY NOTES.

Under a concession formerly held by Belgians, but now worked by Chinese, a line is slowly being constructed in China from Honan, a city of Honan province, to Sianfu, the capital of Shensi province, as a part of the Peking-Hankow system. In February, 1911, coolies were at work on the embankment of this line near Sinan, a small city about 20 miles from Honan. Three years have been occupied in the work so far done. It is understood that the company expects to push the construction of the line as soon as financial arrangements can be made. The board of communications at Peking has planned an extension of this line to Lanchow, the capital of Kansu province, and the survey for this extension was completed in 1911. The board of communications has also announced its intention of extending this line from Lanchow to Ilifu, on the farthest frontier of the empire, the terminus of the proposed extension of the Kalgan-Suiyuan line, about 1,250 miles distant. Surveys for this great extension have been ordered to be commenced immediately.

The Yangtze valley railways in China are in some respects the most interesting problems in the country. The country they serve, is in many respects the richest portion of the empire, and under ordinary circumstances would be the most promising. However, most of the railways, both those constructed and those proposed, parallel the Grand Canal north and south and the Yangtze river east and west. The result is that the vast mass of freight is still carried in native boats, and will continue to be so carried in the future, in spite of railway facilities. Only rich cargoes, like silks, or cargoes of material that can be handled to advantage by machinery or by standard equipment, like coal or ore, can be counted upon by the railways. For example, the Shanghai-Nanking Railway, one of the best equipped of the new lines in the country, well built and well started by foreign promoters, has found it impossible to make money so far, because of the competition of Yangtze river steamers. The Shanghai-Hangchow line, while apparently enjoying a good business and in a position to prosper, has been in the public eye for some time as a result of troubles in the Chekiang Railway Co. and allied interests, and questions of management have so far mixed the situation that the exact financial position of the railway is uncertain, although admitted losses are great. It is announced from Peking that as a result of the general unfavorable situation in the company the government is to take over the line and carry it forward as a government enterprise.

Conventionalities.

Speaking of this weather—can you beat it?

As Friend Bullard aptly puts it, we're here for bUsiness; *not* bOOziness.

Mr. and Mrs. Mark A. Ross, Chicago, are at the Marlborough-Blenheim.

We have been wondering why they put Treasurer Lord in a cage this year.

R. M. Mitchell, superintendent of the Barney & Smith Car Company, returned to Dayton last evening.

The hotel waiters seem to be the only people who know they are dressed according to the rules of the game.

The challenge has been accepted and Harry Vaughan and Leigh Best will match ability on the golf links of the Country Club on Sunday.

George W. Lyndon, representing the Association of Manufacturers of Chilled Car Wheels, was an early arrival and registered at Haddon Hall.

W. J. McBride, president of the Haskell & Barker Car Company, cannot attend the meetings this year, business of importance preventing the trip.

Harvey G. Kittridge, general manager of the Kay & Ess Company, is attending the convention as usual. He is staying at the Marlborough-Blenheim.

R. L. Brown, who represents the National Lock Washer Company in Chicago, will join the sales force of the Barney & Smith Car Company on July 1.

Herbert Green, vice-president and general manager of the Alcohol Heating & Lighting Company, is a firm believer in alcohol—of the denatured variety.

Harry S. Whitehair has just joined the Chicago sales staff of McCord & Company. Mr. Whitehair was formerly connected with the Chicago Varnish Company.

F. M. Lucore, assistant to the general agent of the American Railway Association, was here yesterday. He was particularly interested in car interchange matters.

W. A. Bonitz, recently appointed general manager of sales of the American Vanadium Company, Pittsburgh, with headquarters at Pittsburgh, is attending the convention.

Judging by the gaily bedizened key to the city presented by Mayor Bacharach to President Stewart, a very large and brilliant time may be expected during the convention.

R. W. Bell, superintendent of machinery of the Illinois Central, is making an inspection trip, but will probably complete it in time to get to Atlantic City by next Sunday.

A. S. Goble, who during the last year has been in the sales department of the New York office of the Standard Steel Works, has been transferred to the Chicago office.

F. M. Whittaker, vice-president of the Chesapeake & Ohio, was an arrival Thursday from Richmond. He spent a part of the day at the meeting and among the exhibits.

D. Dunbar, manager of the Acme Supply Company, had reserved Pullman accommodations to Atlantic City, but was compelled to cancel them through the press of business.

J. T. McGrath, superintendent of rolling stock of the Chicago & Alton, is attending the convention with Mrs. McGrath. It is expected that considerable improvements will be made in the motive power on that road in the near future.

Frank W. Furry, general manager of the Ohio Injector Company, and his son, William S., assistant mechanical engineer of the same company, are among the convention visitors.

J. R. Cardwell and L. T. Canfield, president and vice-president, respectively, of the Union Draft Gear Company, arrived Wednesday morning and registered at the Traymore.

It will be regretted that Mr. and Mrs. W. E. Fowler will not attend the gatherings at Atlantic City this year. Mr. Fowler's health will not permit the visit, although he is grealy improved.

Fred. De Long, report says, is seriously engaged in writing a book entitled "Wild Spark Plugs I Have Known." In one chapter he explains, in less than a million words, why spark plugs grow loose.

J. H. Schermerhorn, assistant secretary and treasurer of the Joseph Dixon Crucible Company, is expected on Friday evening. Mr. Schermerhorn will be accompanied by his wife and they will stop at the Chelsea.

Harry Frost tried his best to force summer soon after his arrival at Atlantic City; but judging from the subdued clothes that he has worn since the first day, we take it that someone has tipped him off.

Mrs. C. L. Winey, wife of the secretary and treasurer of the Franklin Railway Supply Company, had been ill for the past three weeks with blood poisoning in the arm. She is reported to be recovering rapidly.

Walter Leach can certainly hand out compliments when he feels so disposed. If you want to hear something real nice, ask him what he thinks about the success of this year's conventions and who is responsible.

Colonel Lacy Williams and Major Grafton Dodd are in town with their famous "Virginia Guards." Napoleon's old grenadiers have nothing on them, for not even an Arizona sand storm could get by their double barrelled front.

F. O. Bunnell, of the Rock Island, is one of a large number of engineers of tests who are in attendance at the conventions this year. Mrs. Bunnell is with him and they are stopping at the Marlborough-Blenheim.

George W. Stevens, president of the Chesapeake & Ohio, is at the Shelburne and will stay here until Sunday. He spent yesterday afternoon amongst the exhibits on the pier. Mr. Stevens is recovering from a recent surgical operation.

Robert E. Frame, assistant to the president, and Herman Pries, general superintendent of the Haskell & Barker Car Company, arrived Wednesday and registered at the Gladstone Hotel. They will stay during both conventions.

W. P. Richardson, mechanical engineer of the Pittsburgh & Lake Erie, will be prevented from attending the conventions this year because of the pressure of work in connection with the drawing up of plans for new equipment.

George S. Allen, who for more than forty years was master mechanic for the Reading at Tamaqua, Pa., is attending the conventions. Mr. Allen began railway service 54 years ago and was one of the early members of the M. M. Association.

Miss Edna Postlethwaite, daughter of C. E. Postlethwaite, spent part of Wednesday on the pier with her father. She is a student at Swarthmore College, and was a guest here of one of her college chums, Miss Haines, of the Hotel Morton.

George T. Anderson, superintendent of the Chicago, New York & Boston Refrigerator Company, a member of the M. C. B. Association, has recently passed through a serious

illness, but is now well on the road to recovery. He will not be at Atlantic City this year.

E. D. Nelson, formerly engineer of tests of the Pennsylvania, with Mrs. Nelson and their two daughters, are stopping at the Strand. Mr. Nelson since leaving the Pennsylvania, has been very busy in the general consulting field, for which his long experience so well fits him.

Mr. and Mrs. J. F. Graham, of Portland, Oregon, heretofore regular attendants at the conventions, cannot make the trip this year. Mr. Graham is assistant general manager of the Oregon-Washington Railroad & Navigation Company, and this year could not leave his office duties.

Miller of the Nickel Plate.

J. D. Murray, formerly mechanical engineer of the Delaware, Lackawanna & Western and later for several years located at Christmas Island in the Indian Ocean, is spending a few days at the convention meeting his old friends. He has been spending the past year in London.

Warren J. Lynch, vice-president of the American Steel Foundries, at New York, is this year for the second time attending the conventions as a supplyman. Prior to taking his present position, he was passenger traffic manager of the New York Central Lines, with office at Chicago.

Dr. J. M. Griffin, president and general manager of the Wheel Truing Brake Shoe Company, one of the regulars at the conventions, is at the Dennis. He has brought with him, as usual, his favorite billiard cues and with his friends will enjoy some leisure time at the "gentleman's game."

J. A. Pilcher, mechanical engineer of the Norfolk & Western, attended the meeting on Wednesday, ready to uphold the recommendations of the committee on Car Wheels, of which he is a member. He then left for Norfolk, but will return on Monday for the Master Mechanics' meetings.

W. O. Thompson, district master car builder of the New York Central & Hudson River and secretary of the Traveling Engineers' Association, reports a large increase in membership for that association and prospects for a still better convention than that of last year, if such a thing is possible.

E. A. Gilbert, who has attended the conventions for many years as a supply man, will be absent this year. He has returned to "his first love," the Southern Pacific, as general inspector of motive power, and on account of a pressure of business will not be able to come to Atlantic City.

B. O. Yearwod, general foreman of the Virginian, has some great stories to tell about the new power which will shortly be placed in service on that road. The new Mallets will have a tractive effort of 138,000 lbs., working simple, and will be the largest and most powerful locomotives ever built.

F. R. McFeatters, Port Perry, Pa., superintendent of the Union Railroad, was one of the first to arrive at the scene of action and is stopping at the St. Charles. He reports a most congested condition at Port Perry, owing to the press of business, complicated by labor conditions in that section.

Mr. and Mrs. E. W. Pratt arrived from Chicago Tuesday afternoon and are guests of the Marlborough-Blenheim. The absence of their daughter, Miss Verona Pratt, will be noted with regret this year by the many friends of the young lady. On June 8 in Chicago Miss Pratt became the bride of Robert Bernardd Barton.

It seems that J. Alexander Brown is not the only one here wearing a badge that resembles the label sometimes found on top of a box of corn plasters. Uncle Bill Lewis is sporting a duplicate of Brown's badge; but not being in the advertising business, he wears it at the bottom of his vest instead of on the lapel of his coat.

L. F. Hamilton, publicity and specialty manager of the National Tube Company, is not here this year, because of a long period of illness. Mr. Hamilton has been confined to his bed for nearly four of the last six months; but he is now very much improved. He is spending a few weeks at his old home in Kewanee, Ill.

Charles F. Thiele Enjoying a Good Smoke.

Those who have closely observed the work of C. Haines Williams, Jr., the new vice-president of the Chicago Railway Equipment Company, at the conventions, will readily credit the rumor of his early appointment as ambassador near the court of St. James. His earnest courtesy and his courteous earnestness are irresistible.

C. D. Young, engineer of tests of the Pennsylvania, is attending the meetings of both associations, as usual. President Stewart, on discovering his presence at the first meeting, appointed him chairman of the dance committee. Mr. Young is now trying to find out who informed the president of his reputation as a cotillion leader.

Sam Lynn, master car builder of the Pittsburgh & Lake Erie, says that the large car repair shop which was built at McKees Rocks, Pa., a number of years ago is being used entirely for repairs to steel freight cars. The steel hopper and gondola cars which were put in service 12 or 15 years ago are now requiring heavy repairs in many cases.

C. L. Acker, master mechanic of the Toledo Terminal, spent Wednesday and Thursday at the convention. Pressure of business made it necessary for him to return to Toledo last night. He was enthusiastic over the exhibit in Machinery Hall and noticed several devices which he feels can be installed in his shops to good advantage.

One of the sweetest guests of the M. C. B. Association is little five-year old Florence Telford, daughter of the purchasing agent of the Queen & Crescent. Mr. and Mrs. Telford, the young daughter and their son Elliott, are staying at the Marlborough-Blenheim. With them is Mrs. C. A. Parquette, wife of the chief engineer of the Big Four.

A. R. Ayers is registered at the Marlborough-Blenheim and will remain for both conventions. Since the last meeting Mr. Ayers has assumed the duties of the newly created position of general mechanical engineer of the New York Central Lines, west of Buffalo. What is of more importance, he has also, in the meantime, assumed the position of a benedict.

G. E. Carson, district master car builder of the New York Central & Hudson River at West Albany, N. Y., is especially interested in the training of car department apprentices and is developing a special course for them, entirely different from that used in the motive power department. Important additions are being made to the car repair plant at West Albany.

Mr. and Mrs. J. E. Marden—Mr. Marden was M. C. B. President in 1903.

Harry R. Warnock, master mechanic of the Monongahela, arrived Wednesday morning. His wife and daughter had preceded him, getting here on Friday last. Mr. Warnock is looking forward with considerable interest to the delivery of six new consolidation locomotives in July. They will have a number of new features and will be more powerful than those now in service.

S. T. Fulton, New York, general sales agent of the Railway Steel-Spring Company, is attending the conventions. Mr. Fulton formerly represented the company in Chicago, and was promoted to his present position recently. Prior to entering the supply business, he was assistant to the president of the Rock Island Lines. This is the second year he has attended the conventions.

J. F. Deems in Action—Was He Selling Supplies or Talking Politics?

J. F. DeVoy, assistant superintendent of motive power of the Chicago, Milwaukee & St. Paul, who is also president of the Cornell Men's Association this year, is closely watching the papers having reports of the work of the crews preparing for the intercollegiate races at Poughkeepsie. Mr. DeVoy rowed in the Cornell 'Varsity crew when he was in college and has maintained his interest in college athletics.

W. L. Kellogg, superintendent of motive power of the Pere Marquette, was among the first of the railway men to register. He is stopping at Haddon Hall. Mr. Kellogg's brother, D. P. Kellogg, master mechanic of the Southern Pacific, is also quartered at Haddon Hall and has become thoroughly interested in the work of this, his first convention in the railway mechanical field.

It is with pleasure that we announce the arrival of "Jay" Henry, of the Safety Heating & Lighting Company. "Jay" is famous as the dare-devil auto driver of Orange, N. J. He was attired in his orange-colored gauntlets when he arrived for the convention and had no sooner reached his hotel than he commenced to expound to his friends his wonderful views regarding the future possibilities of automobiling.

The "Bureau of Information" which, so far as anyone here has been able to discover, exists in name only, said name being duly emblazoned in gold on a three-foot sign, was discovered yesterday morning swinging more or less gracefully between two uprights at Booths 501-3-5. Stephen Mason has been made temporary chairman. It is probable that Secretary Conway will in due course announce where the "bureau" may be found tomorrow.

H. J. Small, general superintendent of motive power of the Southern Pacific, was in the east about two weeks ago and thought at the time that he would be able this year to attend the Atlantic City conventions; but many important matters have since come up, and Mr. Small will therefore be unable to leave his office. He is an important member of both the M. C. B. and M. M. associations, and many will regret his inability to be present at the meetings.

R. W. Burnett, general master car builder of the Canadian Pacific, is stopping with his wife at the Marlborough-Blenheim. The first all-steel passenger coach on the Canadian Pacific is just being placed in service. It was designed and built at the Angus shops and has a number of special features, including a unique roof contruction with a dormer window effect in place of the usual clear-story windows; also a special headlining and a cork floor. Each truck has its own brake cylinder and brake apparatus.

Thomas R. Cook, assistant engineer of motive power of the Pennsylvania Lines West of Pittsburgh, is registered at the Brighton. Mr. Cook, when he was stationed at Ft. Wayne, Ind., was very successful in developing a storage-battery system for equalizing the load on the power plant generators at ore docks. The load on this plant has almost instantaneous fluctuations of large amounts and by the system devised, much smaller generators, which operate at a constant load, have been made possible.

F. C. Pickard, master mechanic of the Pere Marquette at Saginaw, Mich., and president of the International Railway General Foremen's Association, arrived in Atlantic City yesterday. He is enthusiastic about the outlook for the General Foremen's convention at Chicago the latter part of July. The papers which have been prepared are said to be of more than ordinary interest and value, and the indications are that there will be a large attendance, the membership having increased considerably during the past year.

Dan Cupid has certainly been working overtime this year, having added the names of Ross Hayes and George Fox, of the eastern office of the Curtain Supply Company to his lengthy list. Both gentlemen are attending the conventions with their brides. Naturally these happy people are blindly oblivious to things mundane, so they are under the protecting wing of Mrs. Stanley W. Midgley, than whom none is better known. Mrs. Midgley is now enjoying her tenth consecutive convention. She, too, made her dèbut at these conventions as a bride.

H. E. Dickerman came to the convention this year with a very definite idea in his mind of "hanging" his exhibit without any casualties—and he nearly got away with it. But "Dick" weighs about 300, and it is sometimes hard for him to avoid all that starts his way. However, he did manage to hobble far enough away from danger to avoid what might have been a serious accident when one of the I-beams got away from the erecting gang putting up the frame intended to carry his exhibit. As it was, he was badly scraped both on his back and legs; but he stuck to his job and is still there.

Reference to stokers brings a ready response from F. H. Clark who, since his arrival, received news of some splendid work by his very large mallets equipped with stokers. These locomotives are in pushing service on 2 per cent. grade 8 miles long, and on Wednesday made two trips behind trains of 1760 tons, during which the shovel was not used at all and the hook but twice. These locomotives are among the largest ever built and have 99.9 sq. ft. of grate area. This is probably the best locomotive stoker work that has been done. The fuel consumption was at the rate of about 7000 pounds of coal per hour. The stokers are of the conveyer type using crushed coal.

A. J. Stevens, the new vice-president and general manager of the Barney & Smith Car Company, has been with the company since 1897, when he was made assistant lumber buyer. He, together with his father and paternal grandfather, have, in the aggregate, spent 90 years in the service of the Barney & Smith Car Company. Mr. Stevens reached Atlantic City yesterday morning; and he and the newly elected second vice-president and treasurer, J. F. Kiefaber, will go to New York to-day and from there back to Dayton. Mr. Stevens will return on Monday next with President Estabrook.

Prof. E. C. Schmidt, of the University of Illinois, arrived on Tuesday in a receptive state of mind for suggestions from anyone that considers himself an expert in designing locomotive testing plants. The new plant at the University of Illinois is now in course of construction and it is expected to be in operation before the end of the year. It will have a capacity for a drawbar pull as high as 125,000 lbs., and is arranged to eventually accommodate the largest types of Mallets. At the start, however, but four pairs of supporting wheels will be installed. This will be the largest locomotive testing plant in the world.

Eureka! Eureka!! The tyrant trusts, Electric Light and Gas are on the road to oblivion and bankruptcy. No more will struggling humanity have to dodge the meter man, or go to bed with the chickens. Gone are the days when we must use matches to see who should dig up the inevitable quarter. C. W. Wardell has solved the problem. Two little gold fishes (ordinary garden variety), a glass aquarium filled with water, a few glass tubes and a box of pills does the trick. The result is a beautiful white light. Of course, the secret lies in the pills; for these are fed to the fish, which immediately start on a marathon race. This disturbance causes the water to throw off oxygen which, when ignited, produces the above result.

R. D. Smith, superintendent of motive power of the Boston & Albany, who heads the committee on the Maintenance of Superheater Locomotives, is an enthusiastic advocate of superheat. The price of coal in New England is so high that fuel savings amount to more than in the more favored districts which have coal mines along the line. A saving of 25 per cent. in fuel, due to the superheater, when coal is $4.00 per ton, means a substantial gain. Mr. Smith finds also that the firemen appreciate the fact that the amount of coal to be handled for a given trip is so much reduced that they can do better work in keeping up steam to maximum pressure for the whole trip. Incidentally, therefore, the superheater is to a certain extent accomplishing the same object as the automatic stoker though in a different way.

Malicious rumor has it that Wildin broke his bat in last year's game by holding it flat-grained to the ball. This he most emphatically and indignantly denies, and characterizes as maliciously intended. 'Twas a trusty bat, so Wildin says, and carried a long record of home runs unequalled even by the swat-sticks of Wagner, Cobb and Baker. It simply couldn't respond and hold together. True, Wildin had carefully calculated the stress himself in designing the bat; but the force behind the suddenly and intensely developed desire in him to spoil Pitcher Bale's curve and knock the ball to England was far beyond the calculated factor of safety, and really more than any bat should be expected to stand. It naturally broke. Nothing else was left for it to do. Wildin knows it, and so should everybody else. Could anything be simpler? If this rumor (and Downing, of the western team, is suspected of knowing something about it), is still sufficiently rugged to live after the above explanation, given us by Wildin, we will be forced to a conclusion that an asylum or membership in the Ananias Club is the only thing left for the doubting Thomases.

The Exhibit.

The Standard Coupler Company, New York, is no respecter of politicians. It was showing on a slide at its booth yesterday photographs of Taft, Roosevelt and La Follette, Republicans, and Wilson, Harmon, Underwood and Bryan, Democrats.

J. V. Robinson, president of the Robinson Coupler Company, Washington, D. C., will not attend the convention this year. Mr. Robinson is now in British Columbia supervising the installation of connectors on a number of Great Northern cars. Clinton M. Smith, of the same company, is in charge of the pier exhibit.

In spaces 572 and 573 the Acme Supply Company, Chicago, is showing its new diaphragm. The novelty consists in its being made in sections and requiring no hood. Its construction provides for easy repairs and long life. The Apex type shown is especially new in shape, one of its most interesting and valuable features being its sharp drainage at the top.

F. H. Quail and Philip J. Duffy, representing the permanent manufacturers' exhibit of railway supplies and equipment, located in the Karpen Building, Chicago, are here in the interests of this recently established central-western institution. They report considerable success in securing tenants for space in their exhibit. They may be found in Booth 527.

The Storrs Mica Company, Owego, N. Y., has recently shipped a number of mica chimneys and lantern globes to a railway in Peru. In the mountainous country traversed by this railway, there has been a great deal of trouble from breakage of glass lamp and lantern globes, and after a thorough test of the Storrs company's articles, the railway placed its order.

The combination body and truck bolster steel underframe car shown this year by the Mid-Western Car Supply Company, Chicago, combines features which tend to reduce the cost of operation of freight trains by reducing excess dead weight per car, reducing liability of derailment owing to the low center of gravity, reducing first and maintenance cost per car by eliminating the number of parts and weight. By lowering the floor line of the car the cubical capacity is increased, with consequent increased revenue resulting.

A new steam hose coupler with locking device is being exhibited at the booth of Gold Car Heating & Lighting Company, New York. It couples in ordinary way and is steam tight—a slight tap, and it is locked. Also it couples and locks with other makes of couplers. The company is showing another device, which will be appreciated by those who travel in sleeping cars and have experienced the necessity of using pillows or blankets to stop the draughts when the window is raised for ventilation. This is the car window ventilator, or window shield, which provides fresh air without draughts.

There was the half-way making of a dog fight in the booth of the Pennsylvania Flexible Tube Company yesterday morning. The muzzled watch dog of the company stood at the back wagging his pneumatic tail, when a lusty bull terrier in flesh and blood was led by in leash. The goggle eyes and wagging tail were too much for the bull terrier's irritable sensitiveness, and he barked viciously and strained at the leash. Had he not been firmly held the tube company's good natured poodle would have been no more. The crowd that gathered to see a real dog fight was as much displeased as was the real dog when he was dragged away.

The Jones & Laughlin Steel Company, Pittsburgh, Pa., has an attractive exhibit of some of their wares arranged on a pulley, which is made to revolve on a vertical and horizontal axis at the same time. The base on which the pulley turns is a rope sheave. The spaces between the spokes are paralleled, and on these panels is arranged an attractive array of examples of cold rolled shafting, sheets, spikes, twisted reinforcing bars for concrete work, chains, nails, wire, channels, I-beams, rails, special shapes, rounds, hexagons and squares, angles and Z's, all in a number of sizes, showing, in part, the wide range of the products of the company. The exhibit is in charge of W. T. Mossman.

The condensed time tables of the S. C. H. & L. Lines furnishes about all the information visiting railway or supplymen need to get into, or out of, Atlantic City, or to add to their comfort while here. The pages show correct time tables giving connections with through western trains; through express service to and from New York and Philadelphia; officers and members of the executive committees of the M. C. B., M. M. and R. S. M. associations, entertainment program; automobile road map, showing routes between Atlantic City, Philadelphia and New York; map of Atlantic City and a diagram of exhibit spaces and location of each exhibitor. A two-page physical map of North America shows the railways using Pintsch mantle lights and location of Pintsch plants. A copy of this handy reference will be given to visitors calling at the booth of the Safety Car Heating & Lighting Company.

The McConway & Torley Company, Pittsburgh, Pa., is showing a full size model of the Buhoup flexible truck, embodying some improvements in design over the truck exhibited at last year's convention. This truck has been thoroughly tested out in service and has demonstrated its claims of superiority and efficiency over the rigid type of truck. It is being applied to many new locomotive trucks and is an especially desirable truck for this service. Its feature of vertical flexibility allows the truck to adapt itself to all uneven conditions of track, high or low joints, with all wheels firmly on the rails, without any undue strains on any part of the truck, and thus practically eliminating derailment from these causes. While the truck is flexible to vertical movement, it is rigid to any twisting or angular horizontal movement and is always square. It has a wide distribution of load and an increased spring capacity, using either spiral or elliptic springs, insuring a very easy riding truck.

WHY PLUSH FOR CAR SEATS?

The evolution of the modern passenger coach has shown many changes in the form and mechanism of the seats; but the seat covering has remained practically the same through all these changes. Plush serves that purpose better than any other material. Moleskin, hair cloth, leather, artificial leather and rattan have been used; but only in the exceptional case have they been found superior to plush, and by far the greater number of seats have been covered with that fabric. On examination, no other material seems to present so many advantages, and the reason for its use is the natural selection as the result of experience. Plush is durable; it is soft and pliable to the touch; dust, cinders and dirt sink into it; lint and the more solid materials are brushed away by it; air circulates through its meshes, and the yielding surface of plush seems to cling to another cloth surface and give none of the sliding sensations of two hard surfaces in contact. Plush takes any color, and selection has a wide range. Large railway systems use a standard color for reasons of uniformity and economy. Variety is offered by the use of frieze—a high-pile plush with a figure or design in uncut fiber to relieve the solid mass of color. Within the last four years there has been extensive use of friezette—a low-pile plush with the design formed by cut loops. These figures meet the eye against a background of uncut loops, having the elegance and refinement of satin. The car plush industry of this coun-

try centers about Boston. The Bay State Brand is made there by the Massachusetts Mohair Plush Company. W. W. Melcher, of the company, has Booth 22 in the main building, where he tells about car seats and plush and why Bay State Brand is best.

SEVENTY-TON PEDESTAL JAW TRUCK.

The accompanying illustration shows a new design of freight car truck which is exhibited by the American Steel Foundries Company, Chicago. It is intended either for 50-ton equipment using 5½ in. x 10 in. journals, or 70-ton equipment employing 6 in. x 11 in. journals. The standard design of Andrews' cast steel side frame has been so modified that the necessity of a tie bar has been done away with entirely, and the frame is so secured to the journal boxes that the wheels can be changed with even greater facility than is the case with trucks using any of the usual designs of arch bar construction. The frames are known as the pedestal type, being made with jaws on each end which fit over the boxes and engage with guides cast on the sides of the boxes. The weight of the frame and truck holds the jaws securely in place across the top and against the side guides of the journal boxes.

A bolt passing through the lugs on the top of the journal box and end portion of the frame holds the two parts together and eliminates the possibility of the frames becoming separated from the oil boxes in case the car should be derailed. These top journal box bolts carry no weight in service and are subjected to little or no wear. The journal boxes are of standard M. C. B. design with the exception of the side guides and the top bolt lugs.

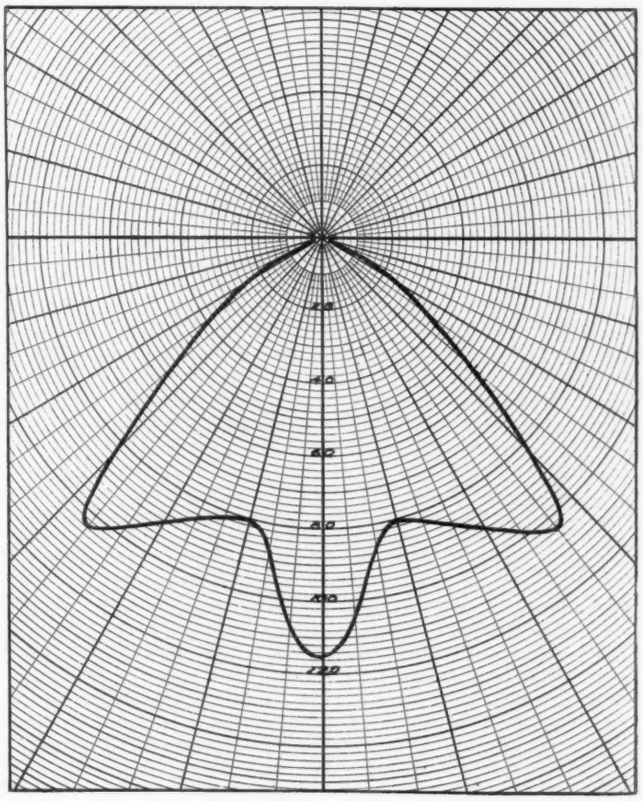
The two side frames of the truck are held rigidly at right angles with the axles by a heavy channel spring plank, which is secured to the spring seat of each side frame by 10 rivets, making a total of 20 rivets per truck. This construction assures the truck remaining square and prevents excessive friction of the wheel flanges against the rail and the abnormal wear of journal bearings and wedges, which occurs when trucks are out of square.

When it is necessary to change wheels on cars equipped with trucks of this design the top bolts are removed from the journal boxes, and the frames are jacked up sufficiently to allow the jaws of the frame to slip out of the journal box side guides, after which the wheels and axles can be rolled out.

As these pedestal jaw frames are intended for use without the usual tie bars or journal box bolts, a material saving in the total weight of the truck is effected, and at the same time the number of parts is reduced. The total weight of the truck exhibited, which has 6 in. x 11 in. journal boxes and is intended for 70 or 75-ton equipment, is 8000 lbs. Other material manufactured by the American Steel Foundries and used on the truck consists of Davis cast steel wheels, the cast steel truck bolster, Ajax brake beams and Simplex bolster springs.

CAR LIGHTING FIXTURES.

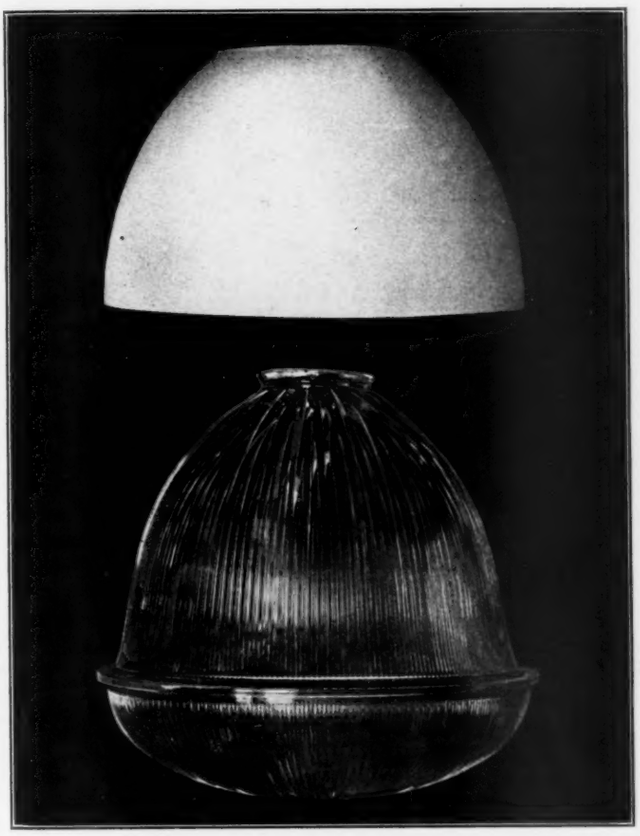
The display of car lighting fixtures at the exhibit of The Safety Car Heating & Lighting Company, New York, is even more attractive than the exhibits made by this Company in former years. Many new fixtures have been developed in



Characteristic Distribution of Electric Center Lamp (reflector-bowl opal envelope type) Using 50-Watt G-30 Tungsten Lamp.

the past year, among which are two types of fixtures known as the reflector-bowl-enclosing envelope-type. One of these fixtures is used with the Pintsch mantle and the other with the electric lamp. The object of using an enclosing envelope with this type of fixture is to eliminate the objection of dust

Seventy-Ton Pedestal Jaw Truck.



Prismaic Reflector-Bowl Unit and Opal Glass Enclosing Envelope.

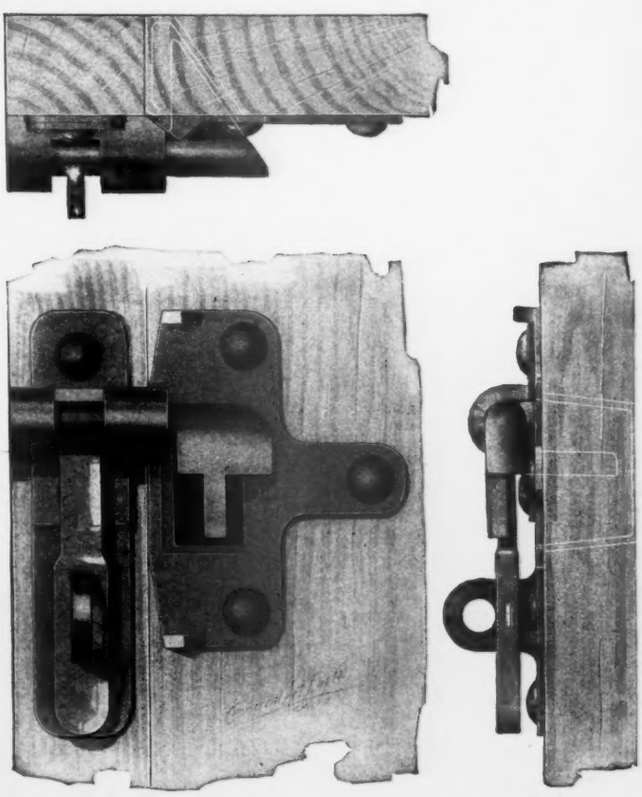
Reflector-Bowl, Enclosing Envelope Type Lighting Fixture Used with Either Pintsch Mantle or Tungsten Electric Lamp.

and dirt collecting on the prismatic glass reflectors and bowls. The reflectors and bowls employed have been designed to give the correct distribution of the light with the maximum illumination on the seats of the car. To accomplish this the prisms in the glass are used on the outside of the reflector and the inside of the bowl. With this arrangement a serious objection arises with the uneven surfaces necessitated by the use of prisms, and presented where they will collect the most dirt. These fixtures are mechanically constructed, so that all dirt is excluded from the interior of the lamp, and from the prismatic surfaces on the outside of the reflector.

The Safety Car Heating and Lighting Company announce that they are in a position to make these fixtures in several different sizes for use on both the center deck and the half deck of the car. The recent installation of these fixtures in some new Frisco dining cars is not only attractive in appearance but is capable of giving the best light distribution from either the Pintsch mantle or an electric lamp.

UTILITY AUTOMATIC LOCK FOR BOX CAR DOORS.

The repair of freight car doors is a large item of expense to railways and, in addition to the actual cost of the repairs, the loss of cars from service while in bad order is often a serious matter. If a car door is damaged so that it cannot be locked and sealed the car cannot be used until repairs are made. While cars are being handled empty the doors bump back and forth and become damaged; the door stops split; the hangers and track are damaged and the back stops and bottom guides are loosened and knocked off.



Utility Automatic Lock for Box Car Doors.

The Utility automatic locks prevent most of this damage, because the first time the car door rolls open or shut it is securely locked so that no matter how rough the switching the door is not damaged.

The accompanying illustration shows the lock. It consists of malleable castings fastened together by three bolts which pass

through the door stop and door post with the nuts on the inside.

The lock consists of a back plate, a loose pin and a clamp over the pin. The pin has a lug at one end to engage with the door and a sealing lever at the center. The hasp on the door has a recess to receive the lug on the pin. When the door is closed, the lug is pushed back, revolving the pin and raising the sealing lever. When the recess is opposite the lug the latter drops into it and the lever falls into place. A seal may be passed through the seal slots and the lever cannot be raised to allow the door to be opened. A padlock may be put through the hole in the lug over which the lever arm rests. The recess in the door hasp allows for any sagging of the door and any variation in the thickness of the door does not affect the working of the lock. The projecting pin wedges the door securely in place and shifting loads cannot bulge it as with the ordinary hasp and pin. The support at the center of the door is also a useful feature.

A lock is also placed on the rear of the door to engage a combination back stop and hasp on the car. This locks the door open. The need of locking car doors open is recognized, as very often it is necessary to dry out or air cars while being handled empty. The locks cannot be removed from the car when the doors are closed, and a burglar cannot enter the car by removing the lock and then avoid detection by replacing it. Utility automatic locks are manufactured by the Railway Utility Company, Chicago.

SEVENTY-TON ORE CARS.

The type of ore car shown in the accompanying illustration has been used for several years by the Woodward Iron Company for carrying ore. The first lot cars were of 100,000 lbs. capacity, the second of 120,000 lbs., and the third lot has been increased to 140,000 lbs. These cars were made by the Pressed Steel Car Company, Pittsburgh, Pa., and are of the hopper bottom center dumping type with the doors hung in pairs. They are operated by means of a chain and gear device and may be easily and quickly opened or closed, by one man, from either side of the car. The floors and hopper sheets are steep and the door openings large and so arranged that the entire load is dumped between the rails. Steel plates, rolled shapes and pressed steel have been used in the construction to obtain a car of the required size, with a minimum weight and yet strong enough to withstand the service to which such cars are subjected.

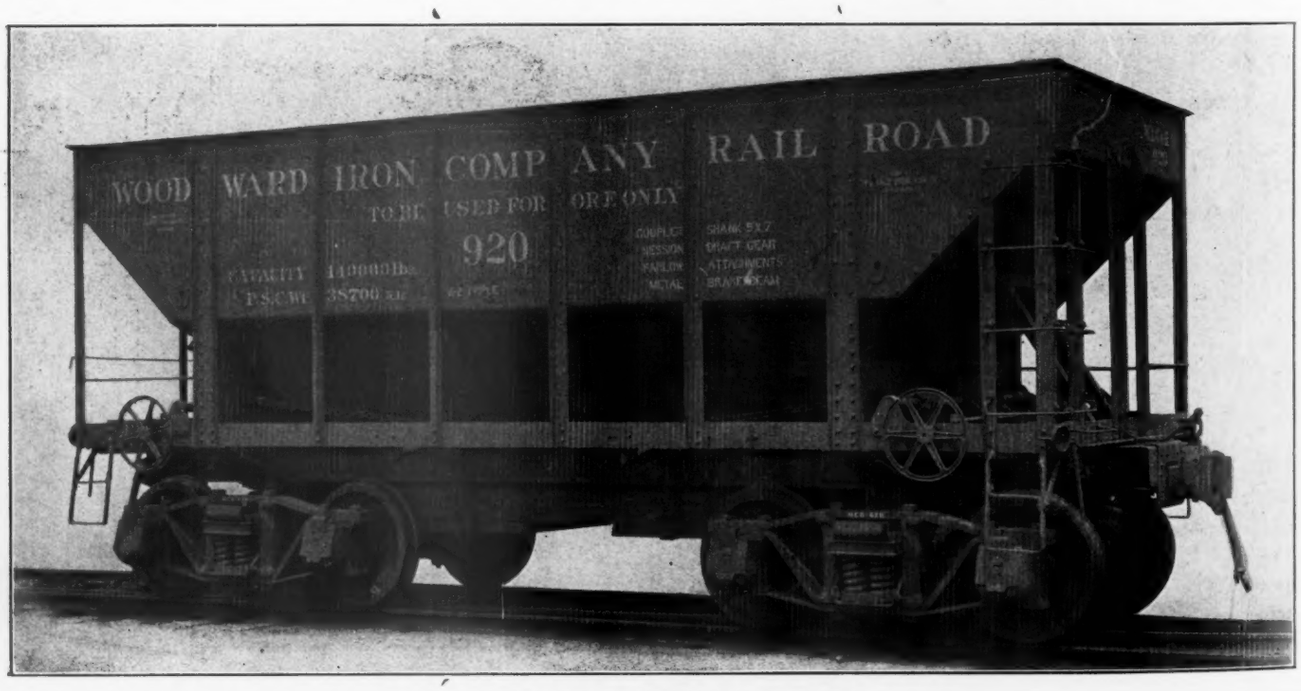
The center sills which extend from bolster to bolster on either side of the door opening, are made of 10-in. bulb angles. The draft sills are made of pressed steel and have the shape of an inverted U. They extend from the end sill back through the bolster web plate and are attached to it by means of a ⅜ in. tie plate on the top and a ½ in. tie plate on the bottom and by 3 in. x 3 in. x 5/16 in. angles on either side. The side sills are made of 6-in. channels and extend from end to end of the car; the end sills are also made of the same size channels and have pressed steel sub-end sills at the coupler opening. The side, end and floor sheets are made of ¼ in. plates substantially reinforced and braced by angles and channels. The corners of the car are additionally braced by means of diagonal braces made of 5-in. channels extending from the bolster and draft sill tie plates to the corner of the car.

The trucks are of the arch bar type with M. C. B. 6 in. x 11 in. axles. They have steel wheels, reliance truck bolsters, pressed steel truss type brake beams, and bearings and stop wedges to suit the latest M. C. B. 6 in. x 11 in. axles. The cars were equipped with the Westinghouse K-D 10-12 air brakes, friction draft gear and 5 in. x 7 in. shank steel couplers with the ordinary release rigging arranged to be operated from either side of the car.

The general dimensions are as follows:

Length inside of body	23 ft. 7 in.
Width inside of body	8 ft. 11½ in.
Width over side stakes	9 ft. 6 in.
Length over end sills	25 ft. 3¼ in.
Height from rail to top of body	10 ft. 3 in.
Distance center to center of trucks	15 ft. 8 in
Length of each door opening in clear	3 ft. 6 in.
Width of each door opening in clear	2 ft. 11¾ in.
Cubic capacity—level	1,105 cu. ft.
Cubic capacity 10 in. average heap	1,275 cu. ft.
Weight of body	18,150 lbs.
Weight of trucks	20,350 lbs.
Total weight of car	38,500 lbs.
Ratio of paying freight to total weight of car when loaded	80 per cent.

Cars of this type have been built for a number of the Western ore carrying roads and have given satisfactory service.



Heavy Ore Car of 140,000 Lbs. Capacity.

Railway Age Gazette

DAILY EDITION

Copyright, 1912, by the Simmons-Boardman Publishing Co.

Vol. 52. NEW YORK—JUNE 15, 1912—ATLANTIC CITY. No. 24b.

PUBLISHED EVERY FRIDAY AND DAILY EIGHT TIMES IN JUNE, BY SIMMONS-BOARDMAN PUBLISHING CO., 83 FULTON ST., NEW YORK.

CHICAGO: 417 South Dearborn St. CLEVELAND: Citizens Bldg.
LONDON: Queen Anne's Chambers, Westminster.

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Subscriptions, including 52 regular weekly issues and special daily editions published from time to time in New York, or in places other than New York, payable in advance and postage free:

United States and Mexico	$5.00
Canada	6.00
Foreign Countries (excepting daily editions)	8.00
Single Copies	15 cents each

Engineering and Maintenance of Way Edition and the four Maintenance of Way Convention Daily issues, North America, $1.00; foreign, $2.00.

Entered at the Post Office at New York, N. Y., as mail matter of the second class.

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WE have had enough experience in the manufacture of cast steel to be able to tell pretty definitely the kind and quality of metal that is needed for various classes of work, and to be able to draw up rather close and reliable specifications as to chemical and physical properties and the tests to which the metal should be subjected. And this is exactly what was done by the committee on specifications for Freight Car Truck Sides and Bolsters. As to the tests for the complete truck side or bolster, the recommendations are tentative and are offered purely for the purpose of obtaining criticisms for future guidance. Probably the desired result will be obtained. In the case of the truck side the proof load will require a factor of safety of about four and for the bolsters about two, which is undoubtedly enough, though it is probable that very few bolsters will pass through a month's service without being subjected to stresses.

SEVERAL errors occurred in the report of the discussions which took place at Thursday's meeting. This was because of inaccuracies in the stenographer's transcript. Among the worst of these errors was one which credited a motion in connection with the coupler report to C. A. Schroyer, instead of to C. A. Seley. Those who are acquainted with Mr. Seley know that he has felt that the M. C. B. Association had made a serious mistake in making a standard of the top lift for couplers, and has used all his influence to change this standard to include a provision for the operation of the lock from the bottom. The motion to include in the standards the operation of the lock from the bottom as well as from the top should have been credited to Mr. Seley.

HAS the steel passenger car passed beyond the point of interest to an association like that of the Master Car Builders? A casual visitor to the exhibits or a regular attendant at the meetings might be inclined to think so. There is not a steel passenger car, or a major part of one, on exhibition, and the term was hardly heard in either the reports or discussions. Only a few years ago there was an extensive exhibit of steel cars, and the features of design and repair frequently came up at the meetings. That there has been wonderful progress in the development of this class of equipment is admitted, but to assume that all the problems have been solved would be a big mistake. There are now nearly as many different designs of steel passenger cars as there are roads using them. It may be that they are all satisfactory, but it is doubtful if there are not features of some which are better than those on others. Where are these problems to be threshed out if not at the meetings of the Master Car Builders' Association?

IT IS useless to expect results from a car department apprenticeship course if the boys are not paid a journeyman's rate when they are graduated. The average boy, after he has served a four years' apprenticeship in the car department and has received a reasonable amount of attention from his instructors and foremen, where a good apprenticeship system is in effect, should be in position to give better service to the company than the average mechanic who has not had such a training. If so, why not pay him the same rate? We like the attitude of one master car builder who absolutely insists that the graduate apprentices be given this sort of treatment. If a boy is not worth a journeyman's wage at the end of four years of apprenticeship, it is either because he is not suited to the work or the railway has not done its duty in training him. If not adapted for the work he should have been dropped or transferred within a few months of the time he entered the service, to a department for which he was better suited. As far as the railway performing its duty in training the boys is concerned, it must do it, or the shortage of good men in the car department, which was so forcibly commented on at last year's convention, will become still more serious.

IN the convention yesterday C. B. Young, of the Pennsylvania, called attention to the fact that THE DAILY yesterday morning published an editorial entitled "Freight Car Trucks," which discussed the report of the committee on Specifications for Tests of Steel Truck Sides and Bolsters before that report had been presented to the M. C. B. Association. On his motion the matter was referred to the executive committee. We hasten to admit the entire justice of Mr. Young's criticism, and to make apology to the association for the error—for error it was. The editorial in question was intended for publication this morning along with the abstract and the report, and not yesterday morning. It has always been the consistent practice of this paper to keep inviolate the confidence of the mechanical as well as all other associations. We fully recognize the fact that it is not only

the right and even the duty to insist on this course being followed by all publications which they honor by entrusting to them advance copies of their reports, and we give the most explicit assurance that only one of those mistakes which are apt to happen even in the best of regulated newspaper families caused this apparent indiscretion.

DURING the "free for all" discussion that filled the interval before the tellers made their report, several very valuable suggestions were made. Mr. Young advanced the idea of having a committee appointed to rewrite the specifications of the association and bring them to a uniform condition of statement and arrangement. Anyone having to use or refer to these specifications will fully appreciate the importance of this idea. The American Society for Testing Materials has had a committee of this kind at work for some time and it was probably the noticeable effect of its work that led to this suggestion. It is to be hoped the executive committee will appoint such a committee and that it will get at its work promptly. Slower speed of freight trains during protracted and severe winter weather, as suggested by Mr. MacBain, will no doubt have a beneficial result on the extremely large number of loose and lost nuts on truck bolts, slid-flat wheels, broken brake beam hangers, etc. Even with slower speed, conditions are frequently so severe as to make it seem impossible to provide a construction that will successfully stand the test. One member mentioned track where one rail was 11 in. out of surface. Under such conditions, even at the slowest speed, the car and trucks receive very severe punishment. Reference to the "stitch in time" is heard so frequently that it does not have the effect it should have. In spite of its repetition the statement of Mr. Brazier hits at the very heart of most of the trouble and expense of both car and locomotive maintenance. Spend $1.50 when it is needed and prevent the necessity of spending $500 in the very near future.

CAR DEPARTMENT APPRENTICESHIP

THE discussion on Mr. Downing's paper on apprenticeship was a distinct disappointment. This is such a tremendously big subject, and there is so much to be said of a serious nature that it is unfortunate that the meeting developed into a series of reminiscences, mostly related to what happened from 25 to 40 years ago. Everybody knows that the car department is confronted with a serious problem because of the shortage of young men who have a thorough knowledge of the business, and nobody will dispute the fact that conditions have become so changed in the past few years that the matter must be approached by radically different methods from those previously followed. There were men in the convention hall who have gained results in the developing of apprentices along the right lines; it is too bad more of them did not participate in the discussions.

There were two bright spots in the discussion. One was when J. J. Hennessey emphatically said that if the railways hoped to get the right kind of young men into the car department they must not only put them on the same basis as the motive power apprentices, as far as remuneration is concerned, but that they must pay them as well after graduation. The other was when M. K. Barnum said that car department apprentices must have a general training and should be transferred from one class of work to another according to a regular schedule, which they would thoroughly understand before they entered the service. This schedule should cover all the more important parts of the work from the repairing of freight cars to such cabinet work as the skill of the individual apprentice will permit. Mr. Downing is undoubtedly right in believing that the best results can hardly be obtained by having a number of highly specialized apprentice courses in the car department and Mr. Barnum's conclusion is the reasonable one.

What is really needed now is action—and quick action. There has been plenty of talk, almost too much. The suggestions made by Messrs. Hennessey and Barnum are logical and will give results for they have been tried out either in whole or in part and are giving good results.

THE FORTY-SIXTH CONVENTION

"A GOOD record of conservative progress." This is the way in which one of the members summed up the forty-sixth annual convention of the Master Car Builders' Association at its close yesterday. The meetings were largely attended; at times the meeting hall was not nearly large enough. Those in attendance seemed to follow both the reading of the papers and the discussions closely, although the latter were possibly not as lively and spicy as many of them have been in the past. In most cases, however, they were right to the point.

Usually the reports or the discussions of some one or two subjects seem to overtop all of the others. Possibly the two subjects which received the most attention at this convention were those on Overhead Inspection of Box Cars and Car Trucks. One paper which many of the members thought would receive more than its share of the discussion received practically none. This was the coupler report. It was necessarily only a report of progress and represents an enormous amount of work on the part of the committee. The problem of adopting a standard coupler will undoubtedly prove one of the hardest tasks the association has ever set itself to perform and possibly the lack of discussion was largely due to the fact that the members generally felt that the committee in charge and the executive committee were on the right track, and with another year's work on the problem would be in position to determine how the problem might best be solved.

The report on Overhead Inspection of Box Cars was one of three reports made by the same committee. The committee on Rules for Loading Materials which had it in charge was also asked to investigate and report on the Damage to Freight Equipment by Unloading Machines. The report on Overhead Inspection was inspired by a meeting between the executive committee of the Association and a committee of the American Railway Association last December. The members generally were not aware that such a report was to be made, but that they have been giving the matter of defective box cars more or less thought and study was indicated by the way in which they took part in the discussion. No question was raised as to the seriousness of the situation, but there was a difference of opinion as to how it should be remedied. On the one hand some of the members felt that it would be an admission of negligence on their part to admit to the railway managers that the equipment was in the condition it was, but that they should set about to remedy it in their own way. Others believed that the matter should be referred to the American Railway Association in order that the car department heads may receive the proper authority and support to go ahead and put the equipment in first-class condition. It will require large expenditures to do this, but after it is once done, the cars can be maintained in good shape.

Time and time again the matter of poor freight car trucks and the resulting derailments and accidents come up, and it is apparent that this matter must also receive prompt and effective treatment without delay.

It was expected that the report on Car Department Apprenticeship would also be thoroughly discussed and while the discussion did occupy a considerable amount of time it was not, with one or two exceptions, to the point.

On the whole the convention will pass down in history as one of the most successful that has ever been held. The association is awake to the importance of its work and the possibilities that lie before it. The spirit of the convention indicated that the members intend to use their best efforts to bring about a thorough and satisfactory solution of the important problem with which they are confronted.

Announcements.

TO-DAY'S AND SUNDAY'S PROGRAMS.

SATURDAY.

Orchestra Concert, 10.30 A. M.—Entrance Hall, Million Dollar Pier.

Base Ball Parade 2.00 P. M.—Million Dollar Pier to special trolley cars.

Base Ball Game, 3.00 P. M.—East v. West, Pennsylvania Railroad Company's Inlet Park Base Ball Grounds. Free trolley cars for those wearing the official badge.

SUNDAY.

Concert 11.00 A. M.—Marlborough-Blenheim Hotel Orchestra, Leo Sachs, musical director: Largo (*Handel*); Two Intermezzi from the Opera, The Jewels of the Madonna (*Wolf-Ferrari*); Andante Cantibille from the String Quartet (*Tschaikowski*); Serenade (*Drdla*); Suite (*Kate Vannah*); (a) Dawn (b) Sleepy Baby; Fantasie, La Boheme (*Buccini*), Violin Solo; Andante from the Concerto (*Bruch*), Michael Benner; Ave Maria (*Gounod*).

Concert, 8.45 P. M.—Overture, Tannhauser (*Wagner*) Violin Solo; Faust Fantasie (*Wieniwski*), Michael Benner; Fantasie Samson et Delila (*Saint-Saens*), Cello Solo; Tartantalla (*Popper*), Leo Sachs; The Lost Hope (*Gottschalk*), Piano Solo; Polonais (*Liszt*), Henry Gruhler; Hungarian Rhapsody (*Liszt*).

WHERE TO DO YOUR CLEANING.

Exhibitors will please assist the committee in charge by insisting that their janitors clean cuspidors at the ocean end of the pier, not in the aisles or vicinity of the boardwalk.

FOUND.

One large coat button and one brass key. Call at office of Secretary Conway

CORNELL DINNER.

The seventh annual dinner of Cornell men attending the conventions will be held at the Hotel Che'sea on Saturday evening at 7.30. All Cornell men are requested to leave a note on Mr. Averill's desk in the booth of the RAILWAY AGE GAZETTE, before 3 P. M. stating that they will be present. The dinner will cost $5.00 a plate.

ENROLLMENT.

The booth for the registration of members and guests of the Master Mechanics' Association will be open at 8.00 o'clock to-night. No charge will be made for badges.

MUSICAL ENTERTAINMENT.

A musical entertainment was given on the Million Dollar Pier last night by the La Favorita Quartette, composed of Katherine Rosencranz, Julia Z. Robinson, Henry Hotz and Anthony D. McNichol, and by Ray Goldsmith and William H. Gwinnutt, vocal soloists; Joseph Cervantes, W. Boecklin, xylophonist, and Eugene Engel's orchestra. Following the programme by the regular entertainers William H. Gwinnutt led the crowd in singing "My Old Kentucky Home," "I Want a Girl," "Put On Your Old Gray Bonnet," "Auld Lang Syne," "In the Good Old Summer Time" and "America."

The committee in charge of the entertainment was composed of Leonard J. Hibbard, chairman; H. E. Oesterreich, E. S. Toothe, Thomas Farmer, Jr., William Miller, L. B. Sherman and T. W. Illingworth.

Proceedings.

President Stewart called the meeting to order at 9.45 Firday morning.

CAR SHOP APPRENTICES.

BY I. S. DOWNING, Master Car Builder, L. S. & M. S.

The recruiting of workmen in the car department has not been given the consideration in the past that it should. The apprentice system is a very good plan if we could get the boy to enter the car department, but in order to get the boys to take up car-department work we must be able to show them some inducement, either in mechanics' rates of pay or a line of promotion. There is no real reason why we should not be able to establish rates which would be sufficient to induce the boys to take up car-department work, without filling their heads full of the idea that some day they will be general manager or superintendent of motive power.

The trades we teach the boys are generally not trades that can be applied generally, and for that reason we should classify them railroad trades. The upholsterer trade in car shops consists of upholstering seat backs and cushions and the tieing of a few mattresses. Tufted work is seldom, if ever, done. What can the apprentice do after he has learned this trade in a railway shop? He con only follow upholstering in railway shops; if he goes to furniture factories or any other commercial concern he will have to learn the trade over. The above is also true of the tinners' trade. Railways purchase practically all tinware, and steel cars have eliminated a great deal of the tinners' work.

The painters' trade is taught more thoroughly, but the work is specialized, and I have known men to do nothing but varnish for 10 years. With reference to cabinetmakers—it is my opinion that the steel car will eliminate the cabinetmakers and carpenters entirely. These 2 trades were the most important trades in the car department and required a great many years to learn. With conversion from wood to steel, the work in these departments will be less complicated, the finish and other parts being machine work and will be ready to apply when received in the shop. Very little time will be required to teach the men how to remove and apply the various steel parts. It will necessarily follow that the cabinetmaker and carpenter will be converted into steel-car men.

It must be admitted that the car department has not the technically trained men that other departments have, and that the car-department salaries are not as attractive as the other departments. It must be admitted by car-department heads that the locomotive department requires more men with technical knowledge than the car department. This is true at least so far as shops are concerned, but I will not admit that there is more executive ability required to manage the locomotive department than the car department. The head of the car-department to-day is an operating officer as well as a car builder; he comes in contact with shippers and other railway officials and coöperates with officials in all departments on his own line. This the locomotive man does not do, except with his own line. A narrow-gaged car man can lose more business in one day than the freight department could solicit in a month.

I do not agree with car-department men that the line of promotion for the head of the car-department should be to superintendent of motive power. It is true some car-department men have been promoted to that position and have been successful; however, it was not due to the car-department training. I will also have to disagree with car-department men that the two departments should be separated, the car department being on an equal basis with the head of the locomotive department. There is too much in common with both departments to separate, and they should be under one head. It would be very encouraging to car-department men if they were considered for promotion through the transportation department. There is no reason why a division general foreman or general car inspector would not be able to fill the position of trainmaster and the master car builder as assistant superintendent, and if he knew his line of promotion was in that direction it would not be difficult for him to fit himself for that line of work, as he follows the operation of trains the same as the trainmaster. We need trained men for what we have to do, and the apprenticeship system is as good a recruiting scheme as I could suggest to supply the shop with trained workmen, but with the inducements we have to offer we do not seem to be able to get the boys—they want to go into the locomotive department, and we get what is left.

In view of the facts stated, relative to the different trades, remuneration and the absence of line of promotion higher than

the head of the car department, it is a question, unless some radical changes are made, whether the recruiting of workmen through the apprentice system is superior to the old helper system.

The accompanying illustrations give as an example of the kind of work the car apprentices of the New York Central Lines are given in their course. The paper closes by giving typical examples of the miscellaneous home problems.

The following is an example of these home problems:

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4. How many feet would there be in the stack in Problem 3 if the boards were 1 in. thick and the cross pieces 4 in. instead of 6 in. wide?

5. Find the cost of material for seventy-two tool racks, each requiring the following stock:

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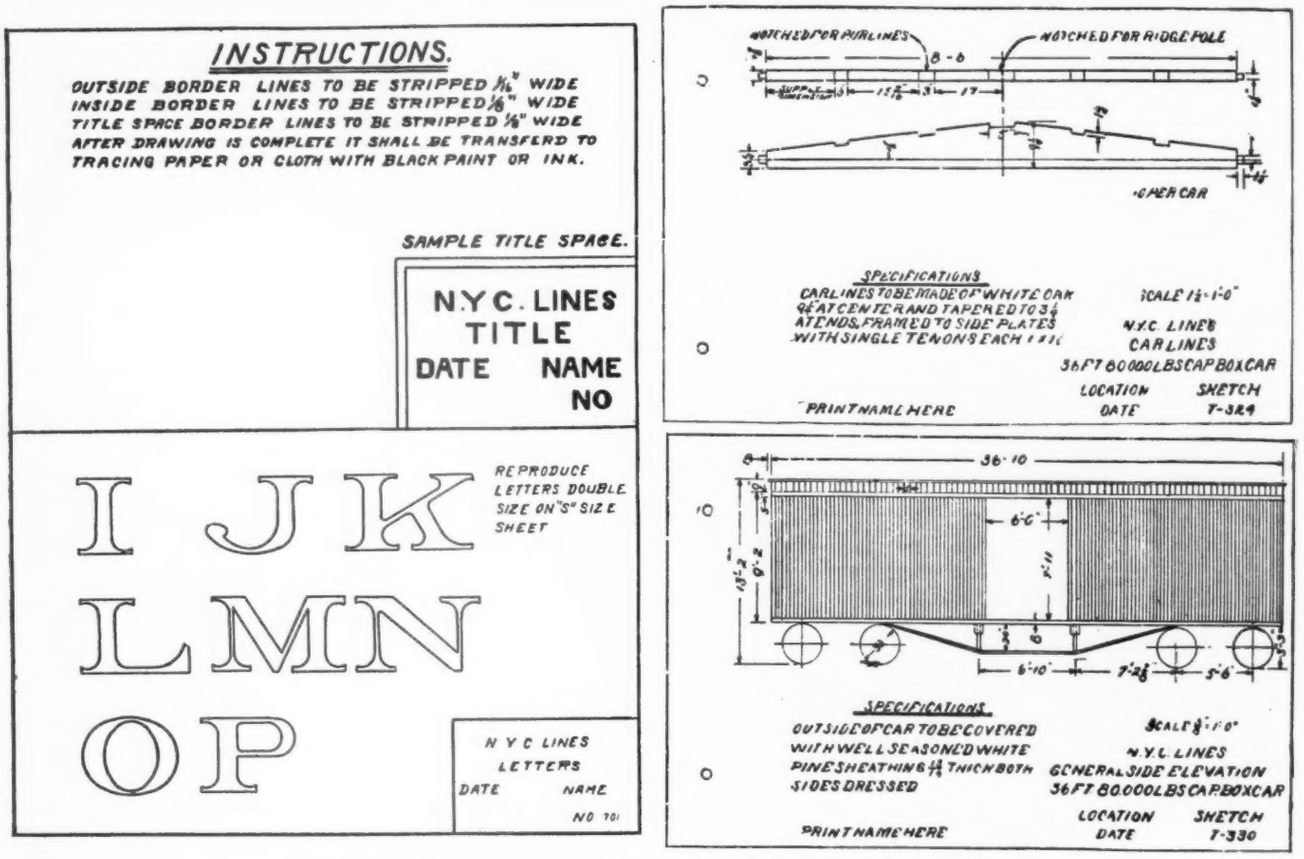

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DISCUSSION.

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I wish to say that in my opinion the paper is well written, but there are some things stated in the paper with which I do not agree—I do not agree in the opinions advanced by the writer. First, I do not believe in having the car department under the same heads as the locomotive department I believe in having the car department under the supervision of the general manager. The car department represents the expenditure of more money than the locomotive department does. The road with which I am connected spends more than $12,000 000 annually in the car department against $8,000 000 in the locomotive department. In my opinion there is not care enough given to the selection of men for positions in the car department. The old way of thinking that almost anyone was good enough for the car department has gone by. The man who has charge of the car department is the man who spends the money. Each day a car foreman can either waste more, or save more than his salary, and it was with a great deal of feeling of regret that sometimes when we tried in days gone by to get a man's pay raised from $75 to $90 a month, a man who is annually handling material representing $400,000 to $500 000 a year, that our efforts to secure such an increase in his pay were unsuccessful; whereas, a master mechanic would be paid $200 a month, and have a small number of men under him and only a little to do, compared to the car foreman only to keep his engines running. I have a warm spot in my heart for the locomotive men, and think that many of them have a harder job than the men in the car department. The engine is the important thing in the operation of a railway. I do not believe we can fully appreciate the troubles and trials that the average enginehouse foreman

has to contend with. We know it is a hard job, and I am not saying anything against that.

I do not agree with the writer about the car department apprentices not having as good an opportunity for advancement as the apprentices in the motive power department. In my opinion, the apprentices in the car department have fully as good opportunity for advancement, and in some cases even better opportunity for advancement, as those in the motive power department have. In the car department the apprentices are worked through the dfferent grades; in any well organized system this should be done. It is true that an upholsterer in the car department may upholster seats and car backs, and would not have the ability to go into a high art building and upholster some of the fine decorations, the fine decorations in such a building, but if he has the stuff in him he will get ahead. We all know it is true in the erection of a building the mason puts the foundation in, the carpenters put up the building and the painters paint it, and the plumbers do their part. The work of mechanics is specialized in all the trades of life, whether in the railway or any other trade. We know that the motive power man turns and fits the wheels, but many of them could not adjust a side rod or tell how many tubes there are in a boiler.

I am a motive power man, in a sense. I served my time as an apprentice in a motive power department, but I finally entered the car department, I am proud to say, at 20 cents an hour, and have risen from the ranks to my present position.

In those days they did not select their car department men from the plan from which we have to select such men to-day, but in those days they selected men who had tools and served their time as apprentices. There are men in this room who came up the same as I did, and who learned his trade thoroughly in a car department. I feel that if I can say anything to encourage the younger element here I want to do it.

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It is up to us to go into the high-ways and by-ways to get the boys by offering them inducements to come in. The inducement is not necessarily one of compensation; it is a prospect of what may come later. I know there are brains enough in the car department to-day to get to the upper levels, but when you get a good man in a place, you want to keep him there. But I really think to-day the trouble we have in the car department is due to the class of men we have to employ for that purpose; and the tendency of individual employment for individual jobs. Now, if a man goes to work on piecework, that man wants to do the kind of work that he can receive the most money for.

Another difficulty with our young men to-day, when they start out in life, is that they want to start at the top of the ladder at once. They want the best compensation, and they will take any class of work that will give them that compensation, and they will leave one class of work for another class of work where they can get 10 cents more for their work. Now, I know when I started out as a young boy, I started out at 18 cents a day and worked 10 hours a day. There are not many boys who will do that to-day. I left a position at $2.50 and took one at $1.50 after having served 5 years at cabinet making, during which time I had received not one cent for my labor. After getting $2 a day back in the seventies, I left the car department in which I was employed, and went into the Pennsylvania Company. In those days they would give you a chance, and they saw I had displayed an inclination to learn the work, and I had to, because I had a wife and baby; and I will say I never had a better place.

There is too great a tendency to-day to find out what pay you are going to get before you let them know what you are going to give them. That is one of the great drawbacks to-day; and it is not confined to the car department. It is confined more forcibly to many other departments of the railway; but I think if we will take an intelligent class of young men in the car departments and put them through all the departments and give them a general knowledge, we will have plenty of men to fall back on in our respectiv departments in the future.

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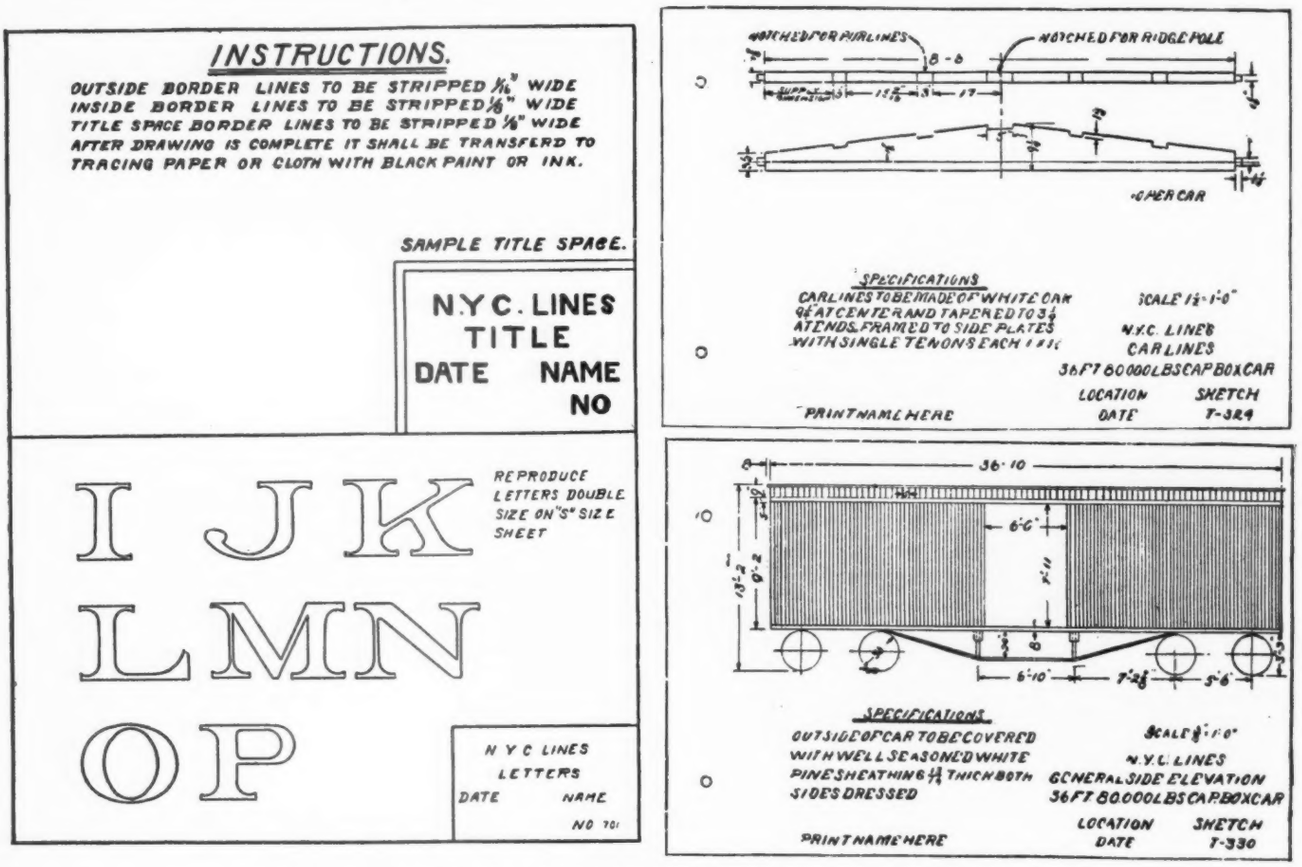

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Referring to yesterday's discussion regarding the need of more money for the repairs of cars: We must have the necessary money to keep our equipment in proper order, but you must have men who can impress their superior officers and show them what is to be done.

J. J. Hennessey (C. M. & St. P.): The main question is: Why are we not getting more bright young men in the car department? What is the future for the apprentice? We might as well look the matter directly in the face. Very few carmen today would advise their sons to go in the car department. Why? Not that he considered the car department as inferior to any department in connection with the railway business, but there is not the same amount of money to be earned in the future in a

car department as in some other department. When a young man serves his time in a car department after spending some years as an apprentice, and in gaining knowledge of all the various branches of the department, his pay may be 30 or 32 cents an hour. If he serves his time in the locomotive department he is advanced at once to the position of a full machinist with a full machinist's pay of from 37 to 45 cents an hour. It can hardly be expected that we shall be able to get bright, intelligent young men to go into the car department and serve an apprenticeship in that department when he cannot see as good an opportunity for promotion as he can see in some of the other departments. The thing which must be done by the railway is to offer better inducements to the car apprentices than are offered in the other departments of the railway service, because to become a thorough car man, the apprentice must do a great deal more hard, disagreeable work; he has got to know how to be a car inspector, know how to repair his trucks, and go through the business from A to Z.

It has been my privilege to have had knowledge of the apprentice system for many years, in both the car department, the machinist department and also in the blacksmith shops, etc. I can turn a young man out of the blacksmith department, or the machinist department, after his regular time, having begun at the same time that the apprentice began in the car department, and this apprentice will be capable of going out and commanding a full day's salary. I ask if we would dare to put a young man, after four years' experience in the cabinet makers' trade, inside a sleeping car that costs anywhere from $18,000 to $25,000. There is not a man living who is a thorough car man, who can become a thorough car man in the same length of time that he can become efficient in any of the other departments.

M. K. Barnum (Ill. Cent.): I believe that there is a distinct field for a car department apprentice, but I do not believe that he should be either a cabinet maker's apprentice, a carpenter apprentice, a painter's apprentice, or an apprentice in the mill. I believe the apprentice should start in with the understanding at the start, between him and the management, that he will be given a chance to learn the business of the entire department, and I believe that a schedule should be arranged which he could look over before he starts work, and see what he is going to learn, see what opportunities he will be given, and that schedule should cover everything in the car department, all the more important parts of the work, from that of repairing a freight car truck putting in a brass, packing a box, up to such cabinet work as his skill and ability will enable him to do properly.

I do not agree with the writer of the paper that the cabinet work is going to be short lived in passenger cars. I believe that the ideal passenger car of the future will still have an interior finish of wood. One other suggestion of the writer of the paper appeals to me, and that is that the car department and the locomotive department should not be actually separated. I believe they should all be considered as part of the mechanical department. But I do believe that the organization of the car department should be given more prominence and that the salaries should be better than they have been in the past, and as to salaries, that matter is fast regulating itself, because the salaries have to be paid in order to get competent men. All who have had occasion to select men for the higher positions of car department work know that it is increasingly difficult to find men who are well qualified, as our friends, the supply men, are drawing so strongly on competent car department men and making their offers so attractive that the railways are being deprived of much of the talent that starts in their employ and shows capacity.

I am tempted to criticise one statement that Mr. Brazier made concerning the life of the steam locomotive. However, I do believe that the importance of electricity in the operation of railways is bound to increase rapidly.

Mr. Downing was given a vote of thanks for this paper.

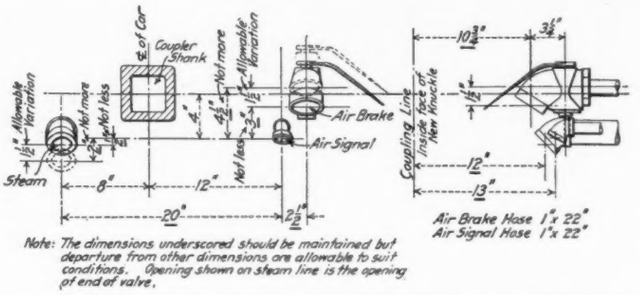
W. C. A. Henry (Penna Lines West): Mr. Crawford is not here this morning and I have been asked to withdraw his name as candidate for the presidency of this association. He is willing to allow his name to stand as a candidate for the vice-presidency.

TRAIN PIPE AND CONNECTIONS FOR STEAM HEAT.

In the 1911 report the committee recommended the following Recommended Practices be advanced to Standards: Two-inch train line; end steam valves, with not less than 1½-in. openings; location of steam, brake and signal pipe, as shown in Fig. 1.

Recommended for adoption as Recommended Practice: Nipple, as shown in Fig. 2; steam hose to be 5-ply, 1½ in. inside diameter and 25 in. long; hose clamp, as shown in Fig. 3; each end of hose to be fitted with nipple, as shown in Fig. 2 and coupler to have not less than 1½-in. opening. The horizontal elevation of nipple to opening through coupler is: minimum, 15 deg.; maximum, 20 deg.; coupler to be tapped with 1½-in. pipe thread. Couplers were considered, but no recommendations were made.

The committee sent out a circular of inquiry, under date of August 14, 1911, from which a number of replies were received, and from the data thus sent in and from investigations during



Note: The dimensions underscored should be maintained but departure from other dimensions are allowable to suit conditions. Opening shown on steam line is the opening at end of valve.

Fig. 1—Location of Steam, Brake and Signal Pipes Recommended for Standard.

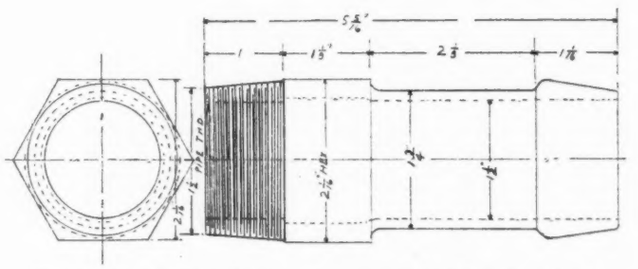


Fig. 2—Train Pipe Nipple Recommended for Standard.

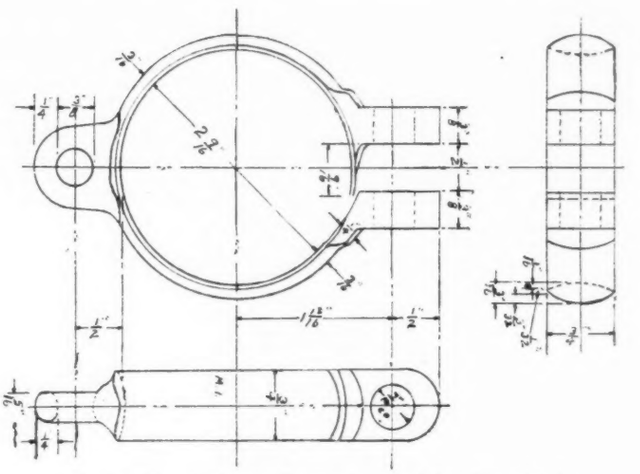


Fig. 3—Hose Clamp Recommended for Standard.

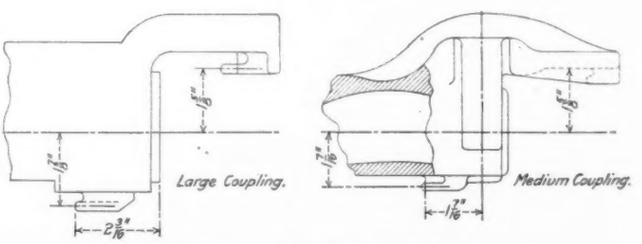


Fig. 4—Large and Medium Hose-Couplers.

the past year, the committee makes the same recommendations, except recommendations for the coupler.

In regard to couplers, the committee finds a large number of roads using the so-called large coupler with 1½-in. full-opening gasket, and equally, if not a larger number, using the medium size with 1⅜-in. full-opening gasket, and a very small number using the small coupler with 1¼-in. full-opening. The latter the committee did not consider, in view of the fact that

the roads using the large size claim they can not operate their long trains successfully with gasket opening less than 1½ in., and the committee being unable to agree on a coupler, two couplers are submitted for the consideration of the Association, which are shown in Fig. 4. The coupler shown as medium coupler with 1⅜-in. can be made to take 1½-in. full-opening gaskets. These couplers are not interchangeable. The question for the Association to decide will be between the heavy coupler with 1½-in. gasket and medium size coupler with 1⅜-in. or 1½-in. full-opening gasket. The committee made service tests of hose to determine the proper angle of the nipple with the opening through the coupler. An equal number of hose manufactured by the same company were fitted up. The angle on half of the couplers was 20 per cent., the other half was 45 per cent. At the end of the test the hose were examined, and there was practically no difference in their condition. While there is no difference in service of the hose by using the larger angle, it is possible to use hose 2 in. shorter, thus effecting quite a saving in hose. Specifications for steam hose have been considered and are submitted herewith. Copies have been submitted to the manufacturers, and their criticisms are also given.

PROPOSED SPECIFICATIONS FOR STEAM-HEAT HOSE.

1. Steam-heat hose must be composed of a tube of rubber, wrapped with 5-ply cotton fabric and the whole covered with rubber.

2. *Tube.* The tube must be hand-made and composed of three calenders of rubber, the middle calender being of a color so much different from the others that the three may be easily distinguished. It must be free from holes, bits of wood, bark, sand and other foreign matter, and from other imperfections. It must be so firmly joined to the fabric that it can not be pulled off without tearing it. It must be free from rubber substitutes.

3. *Fabric.* The fabric must be of duck, made from long-fiber cotton, loosely woven, and weighing not less than 20 ounces per square yard; it must be frictioned on both sides and have, in addition, a distinct layer of rubber on one side, readily visible between the piles when the finished hose is cut open.

4. *Cover.* The cover must be as securely attached to the fabric as is the tube, and be equally free from defects. Both ends of the hose must be covered with caps of rubber, securely vulcanized on in such a manner as to form a continuous member with the tube and cover.

5. *Labels.* Each piece of hose must have securely vulcanized to it a label of white or red rubber, as shown below. The letters and figures must be 1¼ in. high and stand in relief at least 1/32 of an in. Each lot of 200 pieces of hose or less must bear the manufacturer's serial number, beginning with 1 on the first of each year and continuing consecutively until the end of the year. Serial numbers of hose which are rejected must not be used again. With each lot of 200 hose or less, one extra piece must be furnished, free of cost.

6. *Dimensions.*

	Minimum, Inches.	Maximum, Inches.
Length	23¾	24¼
Inner diameter	....	....
Outer diameter	....	....
Thickness of tube	¼	....
Thickness of cover	1/16	....
Thickness of end caps	1/16	¼

7. *Tests.* The railway company's inspector will select for test one piece at random from each lot of 201 pieces, and will subject it to the following tests:

A. *Friction Test.* A section one inch long will be cut from the hose and supported in such a manner that it will turn freely on its axis. A 25-lb. weight will be suspended from the separated end of the fabric. The latter must unwind uniformly, if at all, and not faster than 8 in. in ten minutes. This test may be made at any point in the strip of fabric.

B. *Stretching Test.* One-inch-wide strips of both tube and cover will be marked at points 2 in. apart and stretched until the marks are 8 in. apart, and immediately released and remarked at 2 in.. The pieces will then be stretched until the second marks are 8 in. apart and held thus for ten minutes, then released, and at the end of ten minutes more the distance between these marks will be measured. This distance must not exceed 2⅛ in. If the strips break or develop holes extending clear through their thickness during this test, they will be considered to have failed.

C. *Tensile Test.* A 1-inch-wide strip cut from the tube will be marked at points 2 in. apart and the width and thickness will be accurately measured. It will then be slowly stretched in a suitable tensile testing machine until it breaks. The ultimate tensile strength must not be less than 500 lbs. per sq in., and the elongation at fracture must not be less than 400 per cent. of the original length.

D. *Steam Test.* The remainder of the sample will be suitably mounted on nipples and will be subjected to dry, saturated steam at 50 lbs. pressure for four days of eight hours each, the steam being shut off over night. The cover must not develop any holes or cracks, and the hose must not leak at any point during this test. At the end of the test period the hose will be allowed to cool for sixteen hours, and the friction, stretching and tensile tests will be repeated. The deterioration thus indicated must not exceed 30 per cent. of the figures obtained from the original sample.

E. *Pressure Test.* If desired by the railway company, the piece remaining from the steaming test may be subjected continuously to dry, saturated steam at 100 lbs. pressure for 200 hours, which it must stand without bursting.

8. If the sample fails to pass the above tests, the lot represented by it will be rejected, and the same serial number must not be applied to any other steam hose during the same calendar year. If the sample passes all of the tests, all pieces represented by it will be accepted if free from injurious mechanical defects.

Rejected hose will be returned at the expense of the manufacturer.

CRITICISMS ON SPECIFICATIONS FROM THE MANUFACTURERS.

2. "I presume the object of requiring a middle calender of different color is to prevent the manufacturer from making the tube on a tube machine. Is there any definite proof that a tube

I. S. DOWNING,

Chairman, Committee on Train Pipe and Connections for Steam Heat.

run on a tube machine is not as serviceable as a calendered one? It seems to me that if the tube meets all the tests, that is all that is necessary, and such small points of construction should be left to the manufacturer.

"It is hardly necessary for a tube to be so firmly joined to the friction that it tears when being separated. If this were the case, it would be difficult to obtain a test piece for tests given later in the specifications. An adhesion equal to that called for in the friction test would be sufficient.

4. Comment same as for No. 2.

7. (A) "I would consider a 20-lb. dead-weight test sufficient. A 25-lb. friction increases the cost of the hose, without any particular advantage in service.

(B) "A stretching test is seldom made on steam hose, for the reason that compounds which best resist the action of steam do not take a great stretch or have a small set. I see no advantage but a decided disadvantage in this test to insure good steam-resisting hose.

(C) "It is difficult to obtain an accurate tensile on a straight 1-in. strip. A much more accurate tensile can be obtained on a ½-in. piece cut with a die made for the purpose which is wider at the ends where the piece fits into the jaws of the tensile machine. A low tensile and big elongation will give a soft piece of rubber unfit for resisting steam. Good steam-resisting compounds usually have a tensile higher than 500 lbs. and elongation less than 400 per cent.

(D) "Not enough detail is given in any of the tests given above, leaving too much room for misunderstanding. Much more should be said as to what is meant by 30 per cent. deterioration on the different tests. In the after-steaming friction test

is the deterioration to be figured from the decrease in weight that will pull as much as the 25-lb. weight did before steaming, or will the increased number of inches the 25-lb. weight pulls after steaming be used to figure the deterioration? How would you figure the deterioration on the stretch and set test? Such points should be made clear in the specifications.

"In these specifications, and in most rubber-goods specifications in general, not enough details are given as to the exact method of carrying out the tests. In your own interest, you should eliminate from your testing methods the factor of personal equation and possibility of misunderstanding. Inasmuch as is possible, your specifications should be so worded that there can be no doubt as to how the test is to be carried out and what result is expected or demanded for approval. You should eliminate from specifications things about which there are no data to prove their value—in other words, the test should require no property of the material, the value of which is not known. You should specify physical properties which have a definite bearing upon the quality of the article. The design and use to which the article is to be put should in every case determine the nature and severity of the test. A good factor of safety should be arranged for, but there is absolutely no need for a test four or five times as severe as the article gets in actual service."

RECOMMENDATIONS.

The committee would recommend that the following be submitted to letter ballot for adoption as Standards in the Association:

1. Two-inch train line.
2. End valves with not less than 1½-in. opening.
3. Location of steam, air and signal pipe as shown in Fig. 1.

The committee would recommend that the following be submitted to letter ballot for adoption as recommended Practice of the Association:

1. Nipple, as shown in Fig. 2.
2. Steam hose, five-ply, 1½ in. inside diameter, as shown in last year's report on Print D.

NOTE.—Length to be omitted until the Association has adopted a coupler showing the standard angle.

3. Hose clamp as shown in Fig. 3.
4. Each end of hose to be fitted with nipple as shown in Fig. 2.
5. Specifications for steam hose as noted.

The report is signed by:—C. A. Schroyer (C. & N. W.), chairman; W. C. Arp (Vandalia); J. J. Ewing (C. & O.) and J. S. Downing (L. S. & M. S.).

DISCUSSION.

Mr. Downing: The committee has not been able to agree on the coupler.

H. LaRue (C., R. I. & P.): I think we should send the committee back to consider the matter until they do agree. I would like to ask the reason for the change of the location of the steam pipe from the center line of shank of coupler from 9½ in. to 8 in., also the new location for the air and signal pipes. It seems to have been a change, as near as I can determine, of 1½ in.

Mr. Downing: The old standard showed the distance from the center line of the shank of the coupler. This shows the distance from the center line of the car which is just the same location as was shown on the old standard. The hose is in the same location, and there are a good many straight shank couplers being built, and the coupler being out of center practically all the time, we felt that it would be better to show the center line of the car than the center line of the shank. The hose is the same.

W. E. Dunham (C. & N. W.): I think if you will look at Fig. 1 you will see that the air-brake line ought to be at an angle of 20 deg., the same as in the freight equipment. A great many roads are arranging the air-brake line that way. I think that ought to be changed before it is made standard.

As regards the nipple shown in Fig. 2, I think but a very few roads consider that as a good nipple. There is a great deal of trouble with the nipples pulling out and many roads are using the nipple with a rib around it, on which a two-piece clamp goes over the rib. I do not believe that is a good standard for the association to adopt at this time. The same remarks would apply to the clamp as shown in Fig. 3.

C. D. Young (Penna.): The hose required in the paper has enlarged ends, having a difference in diameter of 3/16 in. It has been our experience that if the manufacturer fabricated hose of a large number of ply over two diameters, a great deal of trouble is experienced in getting good friction, owing to the fact that you have to wind the same fabric over two diameters. I feel that a straight hose is to be preferred to one with enlarged ends. There is no provision made for the manufacturer's serial number on the badge plate which is practically a necessity, if you are purchasing hose under specification, in order to identify the material. Neither do I find on the badge plate the letters "M. C. B." which should certainly be required so that the lines in interchange would know that the hose offered on the car had been purchased under this specification.

Referring to Fig. 3, our experience with the steam hose on long cars is that a large overhang is necessary in using the two-piece clamp, with the lips, so as to hold the heavy hose on the nipple fit. With the heavy couplers which are used, it is almost essential to have a mechanical fit between the nipple and the clamp. Our experience with 5-ply hose has not been entirely satisfactory, and we believe that for high pressure lines, where you are using 120 to 130 lb. of steam, that 6-ply will give very much better service. The increase of one-ply makes little difference in the stiffness or weight of hose and the hose gives much better service under that steam pressure. I believe that the roads which are using a head-end system and are coupling up for turbo-generators with 5-ply hose will have considerable trouble from burst hose with even fairly new hose.

In paragraph 3 of the specifications, it requires that the duck shall be 20 ounces to the square yard. I would like to ask how the committee expect to measure it. The hose is offered as a finished product, and the rubber is imbedded in and attached to the duck, and I do not quite see how the committee will weigh the duck with the calendar attached to it. It seems to me it is very desirable to have in the specifications the duck required, and it should be so stated that we can measure just what is being furnished. I would suggest that the committee standardize the duck required, as at the present time the manufacturers seem to have no standard for 20-oz. material. I have some figures here from five manufacturers of hose. Manufacturer *A* uses 15 x 27 strands per inch, 5 x 3 threads per strand; manufacturer *B* uses 19 x 26 strands per inch, and 5 x 3 threads per strand; manufacturer *C* uses 18 x 26 strands per inch, and 5 x 3 threads per strand; manufacturer *D* uses 24 x 28 strands per inch, and 4 x 3 threads per strand; and manufacturer *E* uses 21 x 22 strands per inch, and 7 x 7 threads per strand.

In making tensile test of these different ducks, there is quite a variation, and I have the figures there of the strengths but it is not necessary to read them. I will say there is considerable variation, and it seems to me, in preference to the simple language which is contained in the specification, *i. e.*, "fabric must be of duck made from long-fiber cotton, loosely woven, and weighing not less than 20 ounces per square yard," that this paragraph should be reconstructed to give the strands per inch, the threads per strand, and the load on the section, so many inches in width for the warp and so many inches for the filler, and in this way it can be determined from the hose which has been offered just what duck has been furnished.

Referring to paragraph 7-A, the friction test: If the section for the friction test is taken where the large end comes down to the small diameter, that is permitted under this paragraph, it will be impossible to meet hardly any friction test at all, as the calendar will have no strength at the place where the duck is stretched over two diameters. I do not believe there is any steam hose made to-day that will pass this specification if the sample was selected at that point.

In section *B* relating to the stretching test, I am inclined to think from our experience that the 8-in. stretch will give too soft a tube which will be undesirable for steam hose. It is absolutely necessary in order to get a high temperature hose to have a high amount of mineral matter in the mixture of the tube, and where a high amount of mineral matter is used, it is necessary to have a more lenient stretching test, and I suggest that this section be looked into further, and that the committee recommend that a 6-in. stretching test be used instead of the 8-in. stretching test. The permanent set required of ⅛ in. for 10 minutes, applies equally to these remarks, as to the length of the stretch. If a highly mineralized filler is used, it is desirable for steam heat work, that the permanent set shall naturally be lower, and it seems to me that the permanent set should be taken out of this paragraph.

The tensile test, paragraph 7-C, calls for a test piece 1-in. wide. I believe it to be fair both to the manufacturer and consumer that it is desirable to have enlarged ends on the test piece and to recommend the test piece which is generally used by laboratories in making this test, one-half inch, and enlarged ends of an inch. 200 per cent. elongation is required under this paragraph, which, for the same reasons stated under paragraph 7-B, I believe to be too high, and it should be reduced to get a good steam hose. It is very necessary in water or air-brake hose, to have a long elongation, but in steam hose service I believe the lower elongation will make better material.

In paragraph 7-D, under the steam test, after the hose has been put into the digester, as required, it is provided that deterioration shall not exceed 30 per cent. I would like to ask the committee how, under paragraph 7-A, friction test, this 30 per cent. deterioration is to be measured. In this paragraph it is required that a 25 lb. weight will be used, and that the hose shall not unwind faster than 8 in. in 10 minutes. You have three factors there which should be considered in deterioration. Does the committee mean to take 30 per cent. for the weight, 30 per cent. for the distance and 30 per cent. for the time, or only one of these requirements, and if so, which one?

Under the pressure test, paragraph 7-E, I believe that under specification requirements as to duck and friction that the 200-hour, 100-lb. pressure could be very easily increased to 300, and very satisfactorily pass the test, I would recommend that this be increased.

In view of the fact that I have made so many objections, I would recommend that this be referred back to the committee for further consideration.

I. S. Downing (L. S. & M. S.): We are obliged to Mr. Young. There was a Pennsylvania Railroad representative on the committee. Unfortunately he did not attend any of the meetings. It would be useless for any of us to try to argue with Mr. Young in regard to this specification, as we are not expert in that line, and for that reason I will not attempt to answer him or to defend the report any more than to say that we had an expert from one of the leading manufacturers, and also an expert chemist, and the Pennsylvania Specifications for them to work with, and that is the result of their work. Unfortunately there are none of the experts present. It would be a very good idea, I believe, if this report was referred back to the committee, and I know that the other members of the committee would be very pleased to have Mr. Young a member of this committee. None of the manufacturers would write us a specification. We feel that if this matter was started right, it would bring the manufacturers in line and get them to either approve or make objections to these specifications, and in that way we could make progress.

Mr. LaRue: I would emphasize Mr. Dunham's remarks in regard to the angle of the angle-cock. I see no valid reason why there should be any change made. We cannot locate the pipes so that we can get the same angle on our passenger car drawings as is shown in the freight car drawings, and I believe it is just as necessary on the passenger cars as on freight cars.

C. A. Schroyer (C. & N. W.): I want to say, as regards that, that we can show the angle of these cut-out cocks at any degree it makes no difference, because they must be made to meet requirements. When you locate the cocks and couple the cars together, and find the hose is chafing against each other, what will you do? You will turn the angle so that they will clear each other.

As regards the specifications for the hose, we cannot get very much worse hose than we are getting to-day. You all know the trouble you are having. The hose could not be made very much worse, but don't you think it would be a good idea to make a move to adopt some standard methods, and then improve on these methods, and not let the matter go on year after year without any action as we have been doing. We have been trying for 3 years to get a report on this subject of hose. Let us do something now. Let us begin to work from the specifications we have presented, using this specification as a basis on which to make improvements and to frame other specifications in the future. As regards the 20-oz. duck, we have always bought duck and indicated the weight of the duck by the ounce, not by the number of threads, or the size of the mesh, or anything of that kind. If we specify 20-oz. duck, the manufacturers will use 20-oz. duck.

Mr. Young: I wanted to say that I omitted to preface my remarks about the specification by saying that I feel the material which is specified in these requirements would probably make very satisfactory steam heat hose. I thoroughly believe the committee has prepared specification which will give better material than the average railway is getting today for steam heat purposes, but I brought up these points to illustrate the testing under the specifications would be a difficult matter as the laboratory must have certain information in order to know that the material is in accordance with the specification and certain details of information must be furnished. The omission of these details makes it very difficult for them to do the work. I agree with Mr. Schroyer that it would be a good thing to let this report go to letter ballot for recommended practice if the committee will take up these details which I have cited in reference to specifications next year, with a view of bringing the subject up again at the next convention. I think it is very desirable to have something for the railways to purchase under, which we do not have at the present time, particularly in regard to the steam heat hose.

F. F. Gaines (C. of Ga.): I agree with Mr. Schroyer that we cannot possibly have anything worse than what we are getting now, and there is a chance of getting a little better hose if we have a specification, and if it is in order I move that we adopt the specification as recommended practice and the committee continued to revise the specification next year.

The President: Will Mr. Young accept that as an amendment?

Mr. Young: Yes.

S. B. Andrews (S. A. L.): I would call attention to the specification for the label, paragraph No. 5, where it says: "The letters and figures must be ¼ in. high and stand in relief at least 1/32 in." That does not seem to be clearly understood by the manufacturers and in place of the word "stand" I suggest we use the word "raised," and that they be at least 1/32 in. above the plane of the badge, the portion of the sentence to read "and raised in relief at least 1/32 of an inch."

TANK CARS.

The tank car committee herewith submits a revision of the existing tank car specifications.

This revision was primarily brought about by the growth in shipments of products which were not handled in tank cars at the time when the original specifications were drawn. It has been considered advisable to also rearrange the order of the paragraphs of the specifications, so as to make it more logical.

Since the original specifications were drawn the great increase in the shipments of naphthas has been a very marked feature of the tank-car business; and within the last 4 or 5 years a new product, known under various names, but principally as "casing head naphtha," has been developed and is now offered for shipment in tank cars.

This product is obtained through the compression, cooling and subsequent expansion of natural gas, which yields a very volatile product, of undoubted value, but also presenting special problems when handled in tank cars. A description of the product will be found under the head of "Liquefied Petroleum Gas," on page 35 of the report of the chief inspector of the Bureau for the Safe Transportation of Explosives and Other Dangerous Articles, February, 1912; also in Technical Paper No. 10, Bureau of Mines, Department of the Interior, entitled "Liquefied Products from Natural Gas," and therefore it need not be further described here.

The raw product, especially that from certain of the gas fields, is entirely too volatile to be shipped, and consequently it is subjected to a partial evaporation, known as "weathering." The resultant liquid, after the evaporation of some of the lighter products, is what is offered for transportation.

This natural gasoline showed a sudden mounting in pressure when the tank was exposed to the flame, the gas catching fire and burning above the safety valve. Generally, it will be noted that the time interval from the lighting of the fire to the initial blowing of the safety valve was very much less with the natural gasoline used than with the refinery gasoline.

When the original specifications were drawn none of the products which were shipped in tank cars showed high vapor tension at the ordinary temperature of transportation, and the setting of the safety valves at 8 lbs. was considered ample to prevent the escape of the liquid in a gaseous form, and at the same time it was shown that it relieved the cars of any dangerous pressure, even in the event of a fierce fire.

The new products have developed a very much higher vapor tension at ordinary temperatures, and the Interstate Commerce Commission has provided for the transportation of such products by a rule reading:

GROUP 2—INFLAMMABLE LIQUIDS.

"RULE 1824. All inflammable liquids in this group must be shipped in . . . . . or in tank cars, provided the vapor tension of the inflammable liquid corresponding to a temperature of 100 deg. F. (90 deg. F. November 1 to March 1) does not exceed 10 lbs. per sq. in.

"Liquefied petroleum gas is a condensate from the 'casing head gas' of petroleum oil wells, whose vapor tension at 100 deg. F. (90 deg. F. November 1 to March 1) exceeds 10 lbs. per sq. in. Liquefied petroleum gas must be shipped in . . . , or in tank cars especially constructed and approved for this service by the Master Car Builders' Association. When the vapor pressure at 100 deg. F. exceeds 25 lbs. per sq. in., cylinders, as prescribed for compressed gases, must be used."

The producers of this product petitioned for a safety-valve setting of 25 lbs., complaining of the excessive losses of the product when shipped in the ordinary tank cars.

Before agreeing to any change in existing tank cars, the tank car committee felt that it was necessary to determine whether the safety valves as prescribed for the ordinary product were adequate to relieve tanks of the usual capacity when loaded with the new product.

It was decided that for this purpose a tank of greatly re-

duced capacity should be used, equipped with safety valves of reduced size, but of the same type as those used on the standard tank cars, and of a capacity as nearly as possible proportioned to the experimental tank.

The American Welding Company, Carbondale, Pa., offered to prepare a welded tank, similar in form to that of the cars, the shell, ends, and dome being all welded, the only cost to the association to be that of the steel plate used, the tank to be returned to the makers after the test. This tank was shipped to Follansbee, West Virginia, mounted on brick piers, and provision made for a gasoline fire underneath, very much as was done at Lima when the original specifications were framed.

Three safety valves, of which one was as nearly as possible of an estimated capacity comparative with that of the standard safety valve on the 6,000-gallon tank, one of an estimated capacity 25 per cent. less, and a third having a capacity of 25 per cent. greater, were prepared and furnished by the Crane Company, free of cost. The first two of these valves were those used in the tests.

The plan was to make fire tests with the same grade of oil that was used at Lima, and then with the new product from the gas wells, with the hope that the resulting pressures from the new product would be near enough to those developed by the refinery product to obviate the necessity for any modification in the requirements for safety valves, and to avoid the necessity of tests with full-size tanks.

The Atlantic Refining Company agreed to duplicate the material used in the original tests, record of which was in existence, and furnished without cost to the association 1,600 gallons of gasoline, 66-deg. Baumé gravity, which was prepared as a close cut—in other words, the gravity was that of a fairly homogeneous liquid, rather than a blend of high and low values. This was very desirable, so as to maintain the gravity of the liquid fairly constant during the tests. This liquid will be alluded to hereafter as "refinery gasoline."

The condensed or casing head naphtha was obtained from the wells immediately around Follansbee, and varied both in gravity and vapor tension, as will be noted in the record of the tests.

Seven tests were made, viz.:

No. 1, refinery gasoline, No. 2 (normal) safety valve, 12-lb. setting.

No. 2, casing head naphtha, same value as No. 1, same setting.

No. 3, casing head naphtha, No. 1 (25 per cent. less) safety valve, 12-lb. setting.

No. 4, casing head naphtha, No. 2 safety valve, 20-lb. setting.

No. 5, refinery gasoline, No. 2 valve, 20-lb. setting.

No 6, refinery gasoline, No. 1 safety valve 12-lb. setting

No. 7, refinery gasoline, No. 2 safety valve, 12-lb. setting. This was a repetition of Test No. 1, in which the burners were not working well, and the heat was not, consequently, as great as in the subsequent tests.

From the results obtained the committee believes that the present standard M. C. B. size of safety valve will fully meet the requirements and properly relieve the pressure when transporting gasoline of a gage as high as 88 deg. Baumé. This in view of the fact that the fires employed during the tests were probably more severe than those to which tanks would be exposed during fires resulting from accidents.

From the vapor tensions shown it was evident that casing head naphtha can not be even normally handled in the present tank cars with valves set at 8 lbs., and that even with the 12-lb. setting there would probably be a loss of liquid through evaporation.

While the present type of tank car would better suit this business with all valves set at 12 lbs. than with the present setting, where at least one valve is set at 8 lbs.; nevertheless it is evident that for the economical handling of this particular grade of gasoline a higher setting is desirable.

The committee feels, however, that rather than to allow the setting down of the valves on the existing tank cars, which aggregate between 35,000 and 40,000 in number, it is better to provide a special car for this particular product, and in doing so to provide for a setting of 20 lbs.

It is believed that the total equipment necessary to handle this entire business would be less than one per cent. of the total tank-car equipment of the country.

While it is perfectly practicable to provide tanks which would be safe with very much higher pressures than 20 lbs., it is felt that it would be undesirable to do so, for the reason that in case of any injury to the tank in the course of transportation, the higher pressures would involve greater dangers in the handling of the cars, and therefore, for the present at any rate, the committee does not recommend any higher setting.

It is evident that any means which will retard the admission of heat to tank cars carrying such materials as casing head naphtha will probably prevent the attainment of the high temperatures which would be reached through the exposure of the naked tank to the summer sun. To determine this a final test was made at Altoona.

The same tank was employed, being lagged with 2 in. of magnesia lagging, protected by a sheet-iron jacket. This tank was mounted again as at Follansbee, and filled with casing head naphtha having a gravity of approximately 87 deg. Baumé at 60 deg. F. The valve used was No. 2, with 20-lb. setting. The fire was obtained by small wood and kerosene.

In this test over two hours elapsed between lighting the fire and the appearance of any flame at the safety valve, notwithstanding the fact that about a half cord of wood and 10 barrels of kerosene were used to maintain the heat under the tank during the test, which lasted about 4 hours.

The results of this test show that whereas with the naked tank the safety valve opened in about 2 minutes after the lighting of the fire, with the lagged tank it required 2 hours and 22 minutes; and that whereas with the naked tank the outage per minute amounted to as much as 114.6 lbs., with the lagged tank this was reduced to a little over 6.6 lbs., and it is probable that had the fire not been so severe as to burn through the sheet-iron jacket, causing part of the magnesia lagging to fall down, the outage would have been considerably less.

This leads to the conclusion that the high vapor tension naphthas should preferably be handled in special cars and that these cars should be lagged to reduce the absorption of heat; under which condition it is most probable that a vapor tension sufficient to raise the safety valve would never be reached.

The attention of the committee has also been called to the question of handling liquefied chlorine gas in tank cars.

This material is used for the removal of the tin from tin scrap.

The number of tank cars in use for this purpose is small, and at the time attention was called to the matter they were not equipped with any safety valves or relief of any kind.

The tanks are welded, and completely lagged, and the shippers, who are also the consignees, objected to the regular safety valve, owing to the fact that the liquid evaporates very sluggishly, that it is exceedingly objectionable when liberated, and that the gas is non-corrosive while dry, but very corrosive in the presence of water.

Various forms of safety valves have been submitted by the shippers, but have been rejected by the committee, for the reason that the setting of the valve could be controlled by a handle, so as to shut it off from action as a safety valve. The owners have agreed, however, to provide a combination of safety valve and fusible plug which will insure tightness.

To settle the question of whether the tank would be relieved before it could reasonably be expected that the fusible metal would start, a test was made at the works of the Goldschmidt Detinning Company, Chrome, New Jersey, with a small-size tank.

The tank was 19 in. diameter inside, 6 ft. 8½ in. long over all, with spherical heads, 19 in. radius; made of ¾-in. steel; all seams welded. It had a dome 12 in. diameter inside, 9½ in. high above sheel of tank, made of cast steel, 1 in. thick, with cover of cast steel secured by bolts. The tank was designed for a working pressure of 300 lbs., and tested to 400 lbs. per sq. in. It was insulated by lagging with two 1½ in. layers of asbestos sponge felt and one 2 in. layer of vitribestos, covered with a sheet-iron jacket, the lagging being carried over sides, ends and dome.

The tank was filled to within a short distance of the top with 1,050 lbs. of liquid chlorine, the gages showing a pressure of 42 lbs. per sq. in., and an atmospheric temperature of 44 deg. F. when the fire was lighted.

The log of the test shows that though exposed to a fire which was certainly as fierce as any which could be expected in a wreck, the exposure of 3 hours and 26 minutes raised the pressure to but 150 lbs., and the temperature to but 140 deg. F.

The tendency with a full-size tank car would be to still further reduce the rate of pressure rise, owing to the fact that the cubic contents increase as the cube of the dimensions, whereas the heating surface increases but as the square of the dimensions.

The committee feels that from the results shown, the probability of reaching a bursting pressure during the duration of an ordinary fire would be remote. Nevertheless, a combined

safety valve and fusible plug, which the users of these cars are perfectly willing to apply, will be called for.

It is probable that from time to time other products, such as compressed oil gases, transported for buoy lighting, compressed oxygen gas for acetylene welding, etc., will be cared for, and it is recommended that it be required that such questions be submitted to the association with the designs proposed for special cars, for these purposes, for the consideration of the proper committee and the approval of the association.

SAFETY VALVES.

The standard safety valves have proved entirely reliable for relieving the pressure where tank cars carrying inflammable products have been exposed to accidental fire. The port or ports of the valve, which are directed downward toward the tank, should be closed, however, to prevent the injury of the tank by the burning gas thus directed upon it.

A safety valve has been submitted to the committee as an alternative for the standard safety valve. The changes are in the form of the seat, to facilitate grinding and to provide a better escape for water which may lodge on top of the valve, it having been complained that in some cases the ordinary form of valve does not have sufficient depth to accommodate the water and cinders which lodge, and that these cinders cause corrosion. Another change is in the form of the lip, which is more flaring, to give a freer discharge of the gas when the valve opens. The form of the valve and stem has also been changed, the stem being free from the valve, so as to prevent any possibility of cocking the spring cage. Still another change is in the form of the top of the eye on top of the valve, which is flattened and provided with a hole, so that the valve may be rotated on its seat, as well as lifted, using a plain pointed fid.

A test of these valves was made, using an empty tank car with a large steam connection, and both the modified valve and the standard valve. All of the valves were found to work very well—popping freely, the pressure dropping ½ lb. before the valve seated. The form of the discharge of the valve was very satisfactory, and your committee is prepared to accept this valve should the designers wish to use it.

The test indicated that the holes in the bottom of the cinder cavity, especially where pointed downward, are objectionable, as during the time the valve is open gas is discharged downward, and in the case of the test at Follansbee it provided a gas flame of a high temperature, which, impinging on the tank, was evidently injurious.

In the proposed alternative valve but one port is provided, and this is turned so as to throw the flame horizontally as far as possible away from the tank.

As regards the setting of the safety valves on existing tanks, the only question is one of expense.

It is claimed that a very large part of the tank car equipment now equipped with safety valves is carrying products having a flash point higher than 80 deg. F., and that with such a product the vapor tension never reaches the eight pounds to which the tank valves are now set.

In the shipment of naphthas, however, especially those of light gravity, there is a probability that the vapor tension, under summer conditions, may exceed 8 lbs., and since the wording of the I. C. C. rule provides for the shipment of products having a vapor tension of not over 10 lbs., it is evidently desirable that safety valves carrying such products shall not allow the leakage of any product which comes within the terms of the requirements, and, consequently, the committee recommends that all new cars and all existing cars which are in the business of carrying naphthas shall have safety valves set at 12 lbs. pressure. Also, that all new valves, and all valves which have to be reset to a pressure of 12 lbs., which in time will result in all valves, except those on special cars, being set at this pressure, and will allow existing cars to handle casing head naphthas which have been weathered so as to show not more than 10 lbs. pressure at 100 deg. F.

The committee believes, however, that the higher safety valve setting of 20 lbs. should be restricted to the special cars assigned to the casing head naphtha business, rather than to require existing cars to be changed to accommodate this particular traffic.

DISCHARGE VALVES.

Complaints have reached the committee which show the necessity for improvement in the construction of the discharge valves on a great part of the existing tank cars. In some cases the valves are attached to the bottom of a nipple extending downwards from the tank, so that in the event of a serious shifting of the tank in the frame or any derailment the nipple is exposed to breakage, with consequent escape of the tank contents.

The committee believes that the better plan would be to have the valve entirely within the body of the tank, the outside extension being merely for the purpose of making connection to the discharge piping, and that the valve should be so placed that, in the event of the breakage of the extension, the valve itself would not be unseated.

Plans have been proposed to dispense with the bottom discharge valve, the scheme in brief consisting of a pipe through the upper part of the tank, reaching downward almost to the bottom into a pocket secured to the bottom, the discharge of the tank being effected by means of compressed air, as now common practice with cars carrying acids. The committee believes that this will be a satisfactory arrangement, and recommends making it optional with car owners.

WELDED TANKS.

The construction of the experimental tank used in the tests at Follansbee and Altoona, which was welded without seams, and which after 8 fire tests does not show any injurious effects from the fires, and has never shown any indication of leakage, indicates that it is possible by this process to make very desirable tanks from the tightness standpoint. The committee believes that this is a very desirable form of tank, due to the absolute tightness which results from the absence of seams, and that tanks of this form should be accepted as an option, but the committee is not prepared to require this form of construction. It does recognize the fact, however, that absolute tightness, particularly when hauling inflammables which are normally under pressure, is a very desirable feature.

The committee feels that the time has come when the safety valves on tank cars should be periodically tested, and the test pressure and date stenciled on the valve, and in order that this may be carried out, it recommends that the absence of the test within the prescribed period and of the stenciling shall be considered an owner's defect.

The report is signed by:—A. W. Gibbs (Penn.), chairman; C. E. Chambers (C. of N. J.), S. K. Dickerson (L. S. & M. S.), E. J. Searles (B. & O.), J. W. Fogg (B. & O.), Wm. Schlafge (Erie) and Thos. Beaghen, Jr. (Union Tank Line).

The following appendix contains the specifications for tank cars.

DEFINITIONS.

Tank Car. Any car to which one or more tanks, used for carrying liquids or compressed gases, are permanently attached.

Tank cars shall be divided into two classes: Ordinary and special.

Ordinary Tank Car. One used for the transportation of products, the vapor pressure of which, at a temperature of 100 deg. F., does not exceed 10 lbs. per sq. in.

Special Tank Car. One used for the transportation of products, the vapor pressure of which, at a temperature of 100 deg. F., may exceed 10 lbs. per sq. in.

GENERAL REQUIREMENTS.

(a) Tank cars offered for movement over the lines of a railway must conform to the following specification.

(b) Tanks which bear evidence of damage by fire must be withdrawn from transportation service.

ORDINARY TANK CARS, OTHER THAN WOODEN UNDERFRAME CARS.

1. No tank cars built hereafter shall be accepted for transportation unless equipped with steel underframing or with reinforced shell. The design and construction of the car throughout must be at least as strong as the following detailed specifications.

2. Steel or iron tanks constructed subsequent to 1903 must be designed for a bursting pressure of not less than 240 lbs. per sq. in.

3. When riveted, all longitudinal and head seams must be double-riveted. Where head blocks are not used, head seams need not be double-riveted.

4. Dome heads and covers must be made of either cast or pressed steel, or of malleable iron. The joint of the dome cap must be made tight against vapor pressure, and when necessary to insure this a satisfactory gasket must be used.

5. Tanks must be carefully inspected and tested with cold-water pressure at least once in 10 years. The test for tanks built prior to 1903 shall be at 40 lbs. per sq. in., and for tanks built since that date at 60 lbs. per sq. in., cold-water pressure, which they must stand without leak or evidence of distress. This inspection and test must be made by the tank-car owners. Tanks when tested must be stenciled with date and place where test was made, and by whom, as follows:

Tested (date) .....
Pressure (pounds per square inch).....
At (place) .....
By (name of firm).....

6. By January 1, 1914, all tanks carrying products that give off volatile inflammable vapors at or below a tempera-

ture of 80 deg. F., and having a vapor pressure of 10 lbs. per sq. in. at a temperature of 100 deg. F., shall be equipped with 5-in. safety valves of approved design, and these valves shall be set to open at a pressure of 12 lbs. per sq. in.

Provided, that where the lading is such as not to give off inflammable vapors (as determined by flash point from Tagliabue's open-cup tester as used for test of burning oils) at a temperature below 80 deg. F., the setting of the 8-lb. valves to 12 lb. may be deferred to such time as the valves require removal.

All required pressures for safety valves are subject to a tolerance of 1 lb. above or below that specified. One valve shall be provided for a capacity of 6,500 gal. or less, and 2 valves for a capacity of more than 6,500 gal.

Where tanks carrying such products are divided into compartments, each compartment must be provided with a safety valve.

7. All safety valves must be tested and adjusted, if necessary, by January 1, 1914, and at intervals of not over 2 years thereafter, and the date of the last test and pressure at which valve is set shall be plainly stenciled on the body of the valve, as follows:

Tested (date) .....
Pressure (pounds per square inch).....
At (place) .....
By (name of firm).....

The test may be made without the removal of the valve from the car, provided the valve unseats at a total pressure corresponding with the area of the seat multiplied by the required pressure. Valves improperly set, or not tested and stenciled at proper intervals, shall constitute defects for which owner shall be responsible.

8. Tank cars carrying volatile non-inflammable products whose vapor pressure at a temperature of 100 deg. F. does not exceed 10 lbs. per sq. in., may be provided with vents depending on frangible lead disks for safety, which vents shall be of approved design or the disks to be of a thickness that shall insure rupture at a pressure not higher than 25 lbs. per sq. in.

9. Tank cars carrying non-inflammable or non-volatile material, such as sulphuric acid, vinegar, linseed oil, cottonseed oil, lard oil, fish oil, tannery products, glucose, molasses, calcium chlorid, caustic soda, silicate of soda, etc., need not be provided with 5-in. safety valves, but each tank must have a small open vent or valve, equal to not less than 2 in. in diameter.

If, for any reason, splashing of the liquid or contamination by moisture is to be avoided, a 2-in. vent with frangible lead disk, of a thickness which will insure rupture at a pressure not higher than 20 lbs., should be used in place of the 2-in. open vent.

10. The center-sill construction of the underframe between bolsters must have an effective cross-sectioned area of at least 30 sq. in.

11. Each car must be equipped with steel body and truck bolsters, steel couplers, and a draft gear of approved design, having a capacity of at least 60,000 lbs.

12. Particular attention must be given to the longitudinal anchorage of the tanks, which must be thoroughly substantial, to prevent injurious end-shifting. The preferable method of securing tank against end-shifting is by anchoring the tank to the underframe at or between bolsters, rather than by means of head blocks, inasmuch as the latter method results in damage to underframe forward of body bolster.

MINIMUM REQUIREMENTS FOR LONGITUDINAL ANCHORAGE.

Tank connection:

Shearing area of rivets 25 sq. in.	For tanks of 8 500 gal-
Bearing area of rivets, 20 sq. in.	lons capacity or over.
Shearing area of rivets, 18 sq. in.	For tanks of less than
Bearing area of rivets, 14 sq. in.	8 500 gallons capacity.

Frame connection:

Shearing area of rivets, 12½ sq. in	For tanks of 8,500 gal-
Bearing area of rivets, 10 sq. in.	lons capacity or over.
Shearing area of rivets 9 sq. in.	For tanks of less than
Bearing area of rivets, 7 sq. in.	8 500 gallons capacity.

13. Tanks must be secured from turning on the underframes either by means of an anchorage or by dome yokes, and must also be secured to underframe by means of tank straps, two for tanks not more than 76 in. in diameter, and four for tanks of greater diameter, or their equivalent.

The sectional area of dome yokes and tank bands must at no place be less than ¾ of a sq. in. or 1-in. round iron upset to 1⅛ in. at threaded end. Cars having no underframe, with tank securely riveted to body bolsters, do not require dome yokes or tank bands.

Explanation: A threaded end, 1⅛ in. in diameter or more, with a body consisting of a flat band 2 in. by ⅜ in. or equivalent section; or round iron 1 in. in diameter, will be accepted as meeting the requirements.

The dome yoke proper which passes around the dome may be a rod ¾ in. in diameter, or its equivalent, to which is secured the strap or rod which is fastened to the underframe. The sectional area of dome-yoke strap must be the same as required for tank straps.

Where tanks are equipped with a greater number of tank bands than called for, the total sectional area of all bands will be considered as meeting the requirements, if they equal the total sectional area of the rods specified.

14. Steel underframe tank cars in which the tank is secured from end-shifting by means of head blocks, must have a longitudinal clearance for tank valve extension of not less than 2½ in. on each side of valves.

15. Preferably the top of the discharge-valve handle should be within the tank, but in the the event that it is carried through the dome, precaution must be taken by packing and cap nut against leakage.

16. If the car has no underframe the tank shell at bottom must be at least ⅝ in. thick, and all circumferential seams in bottom sheet, except head seams, must be double-riveted. The sectional area of the additional metal in bottom of tank shell must be at least 20 sq. in.

17. Each car must be equipped with air brakes of a capacity equal to not less than 70 per cent. of the light weight of car, and at least one hand brake operating the brakes on both trucks.

18. There shall be a push-pole pocket at every corner of the car. Where, from the construction of the car, the push-pole pockets cannot well be placed on the body, they must be applied to the trucks, so placed above the journal boxes that the push pole will push toward the center of the truck.

19. Each truck must have a strength equal to or greater than the strength of the axles used.

20. All tank cars at home on a railway must be inspected by inspectors in the employ of that railway company, and when such tank cars meet the requirements herein set forth.

If foreign tank cars and individual tank cars at home on foreign lines, stenciled with the legend "M. C. B. Construction" by a foreign road, are offered for movement over another railway, and some of the details do not conform to the requirements of the tank-car specification, a report of same should be made through the proper officers to the official in charge of equipment, and the car allowed to proceed until further notice.

OLD TANK CARS HAVING WOODEN UNDERFRAMES.

1. Tank cars having wooden underframes, of railway or individual ownership, will be required to conform to the requirements of the "Specification for Ordinary Tank Cars," relating to test of tanks, safety valves, test of safety valves, 5-in. safety vents with lead disks, 2-in. vent hole or small valve with lead disk, dome yokes, tank straps, etc., brakes, push-pole pockets, trucks, axles, and inspection for compliance with M. C. B. specification, and, in addition, must be as strong as the construction covered by the following detailed specifications:

2. Where tank cars are fitted with cast-iron dome heads and covers not sufficiently strong to stand the necessary 40 lbs. hydraulic test, they must be replaced by others of cast or pressed steel, or of malleable iron.

3. Tank heads less than 7/16 in. thick, bearing evidence of damage from impact with head blocks, should be reinforced at bottom by means of steel plate shoes ⅜ in. thick, riveted to head and shell.

4. If cars are not equipped with intermediate sills, the underframes must have 2 center sills, each not less than 5 in. wide by 10 in. deep, or the equivalent in strength. If the car is equipped with intermediate sills, the center sills must not be less than 5 in. wide by 9 in. deep, or the equivalent in strength. Center sills must not be spaced more than 18 in. apart.

5. Where draft timbers are underneath the center sills, the space between the center sills must be filled in with timbers not less in depth than center sills, extending from end sill to the center of nearest cross-bearer or cross timber, provided the latter is located not less than 4 ft. 6 in. from center of bolster. On cars where the draft arrangement is between center sills, the filler timber must be extended to the cross-tie timber when the cars go to shop for repairs to center sills. Center sills and filling timbers must be securely bolted together by means of ¾-in. bolts. On cars having center or intermediate sills not less than 10 in. wide by 10 in. deep, which may be made up of two 3 in. by 10 in. sills bolted together, the filling timbers may be omitted.

6. End sills not reinforced by buffer blocks must not be less than 9 in. wide by 10 in. deep. End sills 6 in. wide by 12 in. deep, reinforced with buffer blocks not less than 6 in. wide by 10 in. deep and of sufficient length to overlap center sills, will be acceptable as a substitute for 9 in. by 10 in. end sills.

On existing cars, if buffer blocks are used for the purpose of reinforcing end sills which do not come within the specified

requirements, the buffer blocks in no case must be less than 4 in. thick nor end sills less than 6 in. thick. The total strength of the end sill and buffer block must be equal to the strength of the construction specified.

7. Draft timbers secured to inside of center sills and extending to cross-bearer or cross-timber will be accepted as a substitute for filling timbers referred to above. Where center sills are 9 in. wide by 10 in. deep, or over, and draft timbers are placed between same, they need not extend farther back than body bolster, provided they are adequately secured to center sills by means of seven ⅞-in. bolts or their equivalent, and butt against body bolster. Draft timbers located underneath the center sills must not be less than 4 in. wide by 8 in. deep, and each draft timber must be held to center sills, end sills and buffer blocks by means of 7 or more ⅞-in. bolts or 6 1-in. bolts. Where an arrangement for supporting draft timbers is substituted for one or more bolts and the construction is of equal strength, the same will be acceptable. Draft timbers extending beyond bolster must be secured to center sills by additional bolts.

8. The draft gear and draft attachments must be at least as strong as the design required by these specifications. Cars should be provided with draft-gear stops gained into draft timbers or heeled on end sills, filler timber or body bolster, and secured with 5 ¾-in. bolts; but cars having stops gained into draft timbers or heeled on end sills, filler timber or body bolster, secured with three ¾-in. bolts, may be continued in service until such time as they go to shop for repairs, when 5 bolt stops must be provided. In all cases, tail yokes or attachments of equal strength must be used. Tail bolts, tail straps, or American continuous draft gear, will not be accepted.

9. Head blocks must not be less than 10 in. wide unless reinforced by metal plates, and of sufficient depth to extend at least 6 in. above bottom of tank, and may be made of 2 pieces bolted together and bolted to underframe by means of not less than 4 ⅞-in. vertical bolts. They must be cut out to suit curve of tank. The ends of each head block should preferably be tied to corresponding end of head block at the other end of car by means of rods not less than 1 in. in diameter, with 1⅛-in. threaded ends, and each head block supported at center by means of a substantial casting securely bolted to end and center sills. Where the construction of the car does not permit of this fastening, the following may be substituted:

The ends of each head block tied to corresponding end of head block at the other end of car by rods not less than 1 in. in diameter, with 1⅛-in. threaded ends, and each head block secured by 2 stay rods 1 in. in diameter anchored to center sills;

Or, head block supported at center by means of a substantial casting securely bolted to end and center sills and 2 1-in. rods passing diagonally through head block toward bolster and secured to underframe;

Or, head block secured by two stay rods 1⅜ in. in diameter anchored to center sills;

Or, head block secured by two stay rods 1 in. in diameter, anchored to center sills, and two 1-in. rods passing diagonally through head block toward bolster and secured to underframe;

Or, head block secured by 2 stay rods 1 in. in diameter, anchored to center sills, and 2 straps not less than ¾ in. thick and 3 in wide, passing over head blocks and securely fastened to underframe.

SPECIAL TANK CAR FOR CARRYING VOLATILE INFLAMMABLE PRODUCTS WITH A VAPOR TENSION OF OVER 10 LBS. PER SQ. IN. AT A TEMPERATURE OF 100 DEG. F.

1. For these cars the tanks may be either welded or riveted; with or without steel underframes. The welded tank is preferred on account of tightness. Where riveted tanks are used, all longitudinal and head seams must be double-riveted. Heads must be not less than ½ in. thick; and if head blocks are used, heads must not be less than ⅝ in. thick.

2. Domes of steel plate, preferably drawn without vertical seams, riveted or welded to the shell proper. Dome must have a capacity to provide for an expansion of 3½ per cent. of the contents of the tank, measuring from the inside top to shell to the top of the dome. Cover for dome may be secured either by screw joint, by bolting, or by yoke with center screw. Lid must be provided with suitable gasket to insure tightness against the escape of gas under pressure.

3. The safety valves to be of the same pattern as those used for other inflammable products, set to blow at a pressure of 20 lbs. gage pressure, with a tolerance of 1 lb. above or below that pressure.

4. The safety valves must be tested and adjusted, if necessary, at intervals of not over 6 months, and the pressure and date of the last test shall be plainly stenciled on the body of the valve, as follows:

Tested (date) .....
Pressure (pounds per square inch) .....
At (place) .....
By (name) .....

The test may be made without the removal of the valve from the car; provided the valve unseats at a total pressure corresponding with the area of the seat multiplied by 20 lbs. Valves improperly set, or not tested at proper intervals and stenciled, shall constitute defects for which owner shall be responsible.

5. The barrel, ends and dome to be lagged with a thickness of 2 in. of 85 per cent. carbonate of magnesia, or its equivalent, covered with sheet-iron jacket ⅛ in. thick. Tank before lagging to be well painted. The sheets of the jacket to be lapped so as to shed rain and maintain the dryness of the lagging.

6. Tank to be tested before being put into service and once every 2 years thereafter with a cold-water pressure of 100 lbs. per sq. in., which it must stand without leakage or evidence of distress. This test to be made by tank-car owner, and car stenciled with pressure, date and place where test was made, and by whom, as follows:

Tested (date) .....
Pressure (pounds per square inch) .....
At (place) .....
By (name) .....

7. Discharge valves, if used, must be so arranged that the valve shall not project below the bottom of the shell, and the connection pipe must be so arranged that its breakage will not unseat the valve. An alternative arrangement, by which the valve is placed on top of the car and the contents of the car discharged by air, will be accepted.

8. In some convenient location on either the sides or the ends of the car shall be stenciled the words: "For Liquefied Petroleum Gas."

On the side of the dome shall be stenciled: "Caution: Liquefied Petroleum Gas (Casing Head Naphtha): Before removing manhole cover, safety valve must be lifted and held open until the internal pressure, if any, is relieved."

9. All other requirements for these special tank cars to be the same as those for "Ordinary Tank Cars."

10. The designs for these "Special Tank Cars" to be submitted to the Master Car Builders' Association for approval.

SPECIAL TANK CAR FOR TRANSPORTATION OF LIQUEFIED CHLORINE GAS.

1. Liquefied chlorine gas may be shipped in a lagged tank car of approved design, which shall be tested before being put into service with a cold-water pressure of 300 lbs. per sq. in., and stenciled in accordance with the requirements in this respect of the specification for ordinary tank cars.

2. Car shall be provided with an approved design of small safety valve and fusible seal which must be so located that in case the car became involved in a fire the seal would be exposed.

3. The designs for these "Special Tank Cars" to be submitted to the Master Car Builders' Association for approval.

DISCUSSION.

Mr. Gibbs: The manufacturers of the material were very anxious that we should allow the safety valve to be set at a much higher pressure, but the committee were unwilling to allow that. I may say that in all this work we have had not only the co-operation of our own committee, but we have had the co-operation of the Atlantic Refining Company and of the Bureau of Explosives. We have still included in the specifications a specification for wooden underframe tanks. The only reason for retaining it was in changing the order we thought the order might stand afterwards, so that subsequent specifications might cut out all this material, because the rules prevent the construction of any more; so I suggest after this that we cut out all specifications for wooden underframe tanks.

Mr. Brazier: Mr. President, I move that the report be accepted, that whatever recommendations there are be adopted, and furthermore, that the thanks of the Association be extended to that committee.

E. T. Millar (B. & O.): I would like to ask Mr. Gibbs if the tank cars have been used for carrying any particular gas, could naphtha or anything else be carried in such cars?

Mr. Gibbs: My understanding is the cars used for naphtha can be used for any of the naphthas, but would not be suitable for crude oils. If the recommendations of the

committee are adopted, the ordinary tank cars carrying this product will have their safety valves set to 12 lbs., and they can be used for carrying that product which has been weathered or exposed to the air, so its pressure won't run above. Special cars can be used for carrying ordinary gas without any trouble.

Mr. Brazier's motion was carried.

SPECIFICATIONS FOR FREIGHT CAR TRUCK SIDES AND BOLSTERS.

The committee on specifications for truck sides and truck bolsters was appointed by the executive committee in July, 1911, and was instructed to prepare specifications for these structures for freight cars of 80,000, 100,000 and 150,000 lbs. capacity. The appointment of this committee grew out of a recommendation made at last year's convention by the committee on revision of standards. The committee has assumed that it was to deal only with cast-steel structures.

A circular was sent to the members of the Association and to all manufacturers of cast-steel truck sides and bolsters concerning the specifications for the physical and chemical properties of the material and methods of inspection. The information received has formed the basis for the recommendations touching these matters which are embodied in the report. Definite recommendations concerning physical tests of the completed structures are not given, as the funds necessary to make such tests were not available this year. In this connection, however, the committee has had placed at its disposal through the courtesy of C. D. Young, engineer of tests, Pennsylvania Railroad, the results of thorough static and drop tests of bolsters and truck sides of various capacities, and from this information it has drawn up tentative suggestions concerning such tests.

SPECIFICATIONS FOR CAST-STEEL TRUCK SIDES.

The following suggested specifications are based upon a study of specifications now in use by members of the association.

Manufacture.

1. Castings furnished under these specifications must be made of open-hearth steel in accordance with the best foundry methods. They must conform to the dimensions shown on drawings and must be free from rust, scale, blow holes, and shrinkage cracks.

2. Each casting must have the following markings cast upon it in raised figures and letters:

a—Initials of the railway company.
b—Month and year in which cast, thus: 6-12.
c—Manufacturer's serial number and trade-mark (or other designation).
d—M. C. B. S.

3. The manufacturer shall have cast on each truck side two test coupons having a cross section of 1⅛ in. by 1⅛ in. and 6 in. long. These coupons are to be used for the physical and chemical tests and their location upon the casting shall be as specified by the purchaser. There shall be two additional coupons of a cross section not less than the average cross section of the casting, which coupons are to be used to determine the character of the annealing as specified in Section 7.

4. The manufacturer shall protect all castings so that they do not become covered with rust. They must not be painted before inspection unless so specified.

5. Truck sides shall not vary more than 3 per cent. above nor 2 per cent. below what has been determined upon as the normal weight of the casting, except that in case the casting has met all requirements save that of overweight, it may be accepted as of the maximum allowable weight here specified. For the purposes of this requirement, the normal weight shall be previously agreed upon between the purchaser and the manufacturer.

6. When the manufacturer is ready to make shipment of the material, he shall notify the purchaser of that fact and await the arrival of the purchaser's inspector, to whom he must furnish free any assistance and labor needed to make satisfactory inspection, tests, and prompt shipment.

7. All castings shall be thoroughly annealed. Test coupons shall be annealed with the casting before they are detached. To determine the quality of the annealing the inspector will have one of the test coupons, mentioned in Section 3, cut half-way through and broken off from the casting for examination of the fracture. If, in his opinion, the annealing has not been properly done, he may require the casting to be reannealed, using the second test coupon for examination in this case. If, after annealing or reannealing, any casting is so much out of gage as to require heating in order to bring it within the gage, it shall again be annealed before it may be accepted.

Chemical Properties.

8. The chemical composition of the steel shall conform to the following requirements:

Carbon	from 0.20 per cent. to 0.30 per cent.
Manganese	not over 0.70 per cent.
Phosphorus	not over 0.05 per cent.
Sulphur	not over 0.05 per cent.

Physical Properties.

9. The physical properties of the steel shall be as follows:

Ultimate tensile strength, lbs. per sq. in.	not under 60,000
Yield point (by "drop of the beam")	not under 50 per cent. of the ultimate strength
Elongation in 2 in. (per cent.)	not less than the quotient of 1,400,000 divided by the ultimate strength

Inspection.

10. For the purpose of determining whether the physical and chemical requirements are complied with, the inspector shall select at random one casting from each heat. From this casting, the two physical and chemical test coupons (referred to in Section 3) shall be removed by the inspector. One of them shall be subjected to physical tests, but if the coupon casting proves unsound, the other coupon shall be used in its stead for this purpose. From the coupon which has satisfactorily passed the physical requirements, borings shall be made for chemical analysis. In case the test pieces selected do not meet the specifications, all castings from the entire heat represented shall be rejected.

11. At his option, the inspector may require that any or all castings be subjected to sand blast in order to make an examination of the surface for checks or cracks.

12. From each casting rejected by the inspector under these specifications he shall cause to be chipped the "S" of the letters M. C. B. S. which are specified in Section 2.

Tentative Specifications for Static Tests of the Complete Truck Side.

The following tentative specifications are presented for the purpose of securing such criticism as the members of the Association may wish to offer.

13. The truck side selected as representing the heat shall be supported in the testing machine at each end, directly beneath the center line which corresponds to the center of the axle when the truck side is in the truck. The load shall be applied in the center of the bolster opening midway between the points of support, and the allowable deflection shall be measured at this point. When so mounted, the truck side shall be subjected to the initial load stated in the following table. This initial load shall be next reduced to 5,000 lbs. and then increased to the proof load as stated. Under this proof load there shall be no permanent set and the deflection shall not exceed the amount indicated:

For cars of	Initial load, pounds.	Proof load, pounds.	Maximum deflection.
80,000 lbs. capacity.....	20,000	135,000	⅛ in.
100,000 lbs. capacity.....	25,000	160,000	⅛ in.
150,000 lbs. capacity.....	35,000	210,000	⅛ in.

Recommendations Concerning Truck Sides.

The committee recommends:

1. That the specifications concerning freight truck sides contained in Sections 1 to 12, inclusive, be made standards of the Association.

2. That the work of the committee be continued, and that, if possible, funds be provided to make tests upon which specifications for physical tests of the complete truck side may be based.

3. That some committee of the Association, competent to deal with matters of design, be directed to prepare designs of cast-steel truck sides for freight cars of 80,000, 100,000 and 150,000 lbs. capacity, to serve as a guide to those members of the Association who now buy these structures made from designs which they do not themselves prepare; in the expectation that such designs may eventually be added to the recommended practice of the Association.

SPECIFICATIONS FOR CAST-STEEL BOLSTERS.

The following suggested specifications are based upon a study of specifications now in use by members of the Association:

[The following 12 sections are identical with those presented in the specifications of the truck sides, and will therefore be omitted here.—EDITOR.]

Tentative Specifications for Static Tests of the Complete Truck Bolster.

The following tentative specifications are presented for such criticism as the members of the Association may wish to offer.

The static test proposed below is intended to subject the bolster to stresses which shall be similar in amount and direction

to those which it receives in service. To this end the bolster would be inclined in the testing machine both sidewise and endwise, and subjected to a vertical load. The angles chosen would be such as to give the following relative magnitudes to the downward, transverse and longitudinal stresses:

Load normal to the center plate surface	100 per cent.
Side thrust	25 per cent.
End thurst	40 per cent.

The above stated relation between stresses is derived from the report of the committee on axles, journal box, bearing and wedge, page 149 of the Proceedings of the Association for 1896. The proposed tentative specification is as follows:

13. The bolster selected as representing the heat shall be supported in the testing machine as mentioned, it being tilted sidewise through an angle of 13 degs. 4 min., and endwise through an angle of 21 degs. 13 min. The load shall be applied vertically through a block with a horizontal upper face, which rests upon the bolster center plate. When so mounted the bolster shall be subjected to the proof load stated in the following table and the load shall then be decreased to 1,000 lbs. Under this proof load there shall be no permanent set and the deflections shall not exceed the amounts indicated. For the purpose of measuring set and deflections the position of the bolster under the load of 1,000 lbs. shall be considered as the datum.

For Car of	Proof Load.	Deflection Normal to Center plate.	Lateral Deflection.
80,000 lbs. capacity....	110,000 lbs.	0.15 in.	0.10 in.
100,000 lbs. capacity....	140,000 lbs.	0.15 in.	0.10 in.
150,000 lbs. capacity....	210,000 lbs.	0.15 in.	0.10 in.

Recommendations Concerning Truck Bolsters.

The committee recommends:

1. That the specifications concerning freight truck bolsters contained in Sections 1 to 12, inclusive, be made standards of the Association.

2. That the work of the committee be continued, and that, if possible, funds be provided to make tests upon which specifications for physical tests of the complete truck bolster may be based.

3. That some committee of the Association, competent to deal with matters of design, be directed to prepare designs of cast-steel truck bolsters for freight cars of 80,000, 100,000 and 150,000 lbs. capacity, to serve as a guide to those members of the Association who now buy these structures made from designs which they do not themselves prepare; in the expectation that such designs may eventually be added to the recommended practice of the Association.

An appendix to the report gives a synopsis of the answers received from the circular of inquiry.

The report is signed by:—Edward C. Schmidt (Univ. of Ill.), chairman; J. S. Sheafe (Ill. Cent.) and C. D. Young (Penna.).

DISCUSSION.

I. S. Downing (L. S. & M. S.): I think the committee should be continued for another year, and in addition to truck bolsters and truck sides of freight cars, they should consider the question of passenger trucks. I move that the report of the committee be accepted, the committee continued, and that they consider passenger truck frames.

C. D. Young (Penna): Do I understand that that refers the entire matter back to the committee as to the specifications in paragraphs 1 and 2? It seems to me it would be advisable to let the specifications go to letter ballot and the committee be continued if necessary, and go after further details. I would like to amend the motion that the subject matters of one, two and three, be referred to letter ballot.

J. F. DeVoy (C. M. & St. P.): I was rather of the opinion as expressed by Mr. Young, except for recommendation of No. 3, and I am not clear in my mind just how they intended to handle that.

The motion was carried with Mr. Young's amendment.

CAPACITY MARKING OF CARS.

The committee appointed to look into and report on the subject of capacity marking of freight cars desires to refer to the report of the committee on axle limits passed upon by the Association at the meeting held at Atlantic City in June, 1906, (see pages 299 to 310 of the Proceedings for that year).

It would seem this subject of capacity marking of cars was thought to have been definitely disposed of by the Association at that time, and the interchange rules were changed to conform to the recommendations of the committee; it will be noted that Interchange Rule 86 makes it optional with the car owner whether he shall stencil his cars with the light weight and nominal capacity, or with the light weight and maximum weight, depending upon the axle requirements specified in this rule. However, in order to secure the individual car owner's views in regard to this subject at this time, the committee sent out a circular to all car owners.

The committee is in receipt of forty-three replies—a careful analysis of which is as follows:

SUMMARY OF REPLIES TO M. C. B. CIRCULAR NO. 25 CAPACITY MARKING OF FREIGHT CARS.

	No. of Replies.	Cars Represented.
In favor of stenciling cars with their light weight and maximum weight.	19	319,535
Against stenciling cars with their light weight and maximum weight. (There were no specific reasons indicated in the replies).	8	204,085
Against stenciling cars with their light weight and maximum weight for the reason that the maximum weight stenciling is likely to confuse shipper or car inspectors.	6	121,850
Against stenciling cars with their light weight and maximum weight, for the reason that it has not been demonstrated that this practice might not be applied to cars, the body or trucks of which are structurally weak, and which are at present stenciled to carry the maximum load to which they should be subjected)	5	209,153
In favor of stenciling cars with their light weight and nominal capacity, also maximum lading	3	84,079
In favor of stenciling cars with their light weight and nominal capacity plus 10 per cent. (For instance, an 80,000-lb. capacity car would be stenciled 88,000-lb.)	1	14,000
In favor of stenciling cars with their light weight and maximum lading	1	11,000
Totals	43	963,702

It would appear from this that, notwithstanding the authorization given the car owner as expressed by the vote of the

C. E. FULLER,

Chairman, Committee on Capacity Marking of Cars.

Association on this subject at the convention held in June, 1906, a great many companies are timid about adopting the light weight and maximum weight stenciling, for the reason, apparently, that they have no evidence that the construction of cars (including steel and steel underframe equipment) is so consistent as to justify the belief that the car can be loaded up to the full carrying capacity of the axles. It would, therefore, seem desirable for the Master Car Builders' Association to determine for itself the minimum strength of car bodies of each nominal capacity to which the maximum weight stenciling shall apply, and the committee, in order to go into this subject more exhaustively,

would recommend that time be granted in which to further consider this subject and make the report.

The report is signed by C. E. Fuller (U. P.), chairman; M. K. Barnum (I. C.); A. W. Gibbs (Penna.); F. H. Clark (B. & O.) and F. W. Brazier (N. Y. C. & H. R.).

DISCUSSION.

C. A. Seley (C. R. I & P.): I move that the suggestions of the committee be adopted, that they be granted additional time, and that the committee be continued.

The Secretary: I would like to read some comments from Mr. Fuller, the chairman of the committee, which are as follows:

"Referring to the report on capacity marking of freight cars:

"This association, at its 1905 convention, appointed a committee to look into and report the merits of stenciling cars with their light weights and maximum weights; the recommendation of that committee, which clearly set forth the principles I have been advocating, was accepted by the convention held in June, 1906, and having been approved by the convention, committed the members of this association to the practice of ultimately stenciling all cars with their light weights and their maximum weights. Further, in accordance with this idea, certain changes were made in dimensions of axles, and interchange rule No. 23 (present rule No. 86) was promulgated to show the minimum dimensions of axles for the different capacities of cars marked 'maximum weight.' It was thought that a majority of the car owners would avail themselves of the increased measure of carrying capacity thus afforded, after they had increased the sizes of their axles to conform to dimensions prescribed in the interchange rules.

"After the lapse of 6 years in which to work into the axles specified for the different 'maximum weight' stenciling of cars, are we to be held back another indefinite period before we can enjoy the benefits intended by such changes because we are told that some car bodies or trucks may not have been constructed to carry as great a load as the axles? Or are we going to be consistent with ourselves and reconsider and rescind the action taken by the 1906 convention?

"The majority of the committee appointed by this association in June, 1911, is not favorable to the 'maximum weight' plan of stenciling, and car owners are not enthusiastic over the plan as is evidenced by the views expressed in reply to the committee's circular. It would seem from the replies received that a great many car owners want to be 'shown' and the committee has, therefore, incorporated into its report a willingness to 'show' up the carrying capacity of car bodies if its suggestion to do so is approved by this association. It was not possible for the committee to bring in a complete report to this convention, owing to the late date at which the views from the car owners in answer to the committee's circular of inquiry were received. It would seem to be necessary and advisable to remove all doubt relative to the carrying capacity of car bodies, and if it should be found by the committee assigned to that task, that there are steel or steel underframe or all wood cars which are not up to the requirements of the carrying capacity of the axles with increased dimensions as required in interchange rule 86 for 'maximum weight' stenciling, then I must confess that such investigation would be as great a benefit to the railways as the measure to increase the carrying capacity.

"If it were found that some car bodies were structurally weak, I would be in favor of defining the minimum, and would exclude all cars below that minimum from the 'maximum weight' plan of stenciling, and I would, furthermore, be in favor of modifying such other rules as would hold the car owner responsible for failure under fair usage of cars, so excluded from the 'maximum weight' plan of stenciling, either by amending interchange rule No. 42 for steel and steel underframe cars, or by increasing the combinations now in force for wooden cars. I am not at all convinced that it will be necessary to adopt this course, but should it be found necessary to do so, this discussion will at least have served a good end, possibly will result in being a greater boom to the railways than the adoption of the 'maximum weight' stenciling which promised to increase the net tonnage per unit of equipment.

"There seems to be a misunderstanding on the part of some of the members of the association in connection with this discussion. It appears that this 'maximum weight' stenciling is thought to be something new, something which has been recently brought before the association, but on the contrary, it should be noted that the association approved of this method of stenciling 6 years ago. The matter was brought up at last year's convention as it was thought that sufficient time had elapsed in which car owners could get their cars equipped with the axles prescribed in interchange rule No. 66. Now that further objections have been raised to this plan, I believe it will serve a good and useful purpose to institute an investigation in regard to car bodies, etc., and have recommendations made to this association in regard thereto in order to permanently dispose of this subject."

Mr. Seley's motion was then carried.

CONCLUDING EXERCISES.

The Secretary presented the report of the committee on correspondence and resolutions, as follows:

The committee would recommend that the appreciative thanks of the association be extended to President Stewart for his excellent address and the splendid manner in which he has conducted the proceedings of this convention; to the officers in general for duties well done in handling the many details in connection with our convention; to the various committees that have considered and reported on the various subjects assigned to them; to the committee on arrangements for its effective service in making such complete plans for the meeting; to the railways for courtesies extended; to the hotel men of Atlantic City for their hospitality; to the Railway Supply Manufacturers Association for the complete exhibition of railway appliances; to the technical press generally, and to the RAILWAY AGE GAZETTE, especially, for the daily reports of all the features of the convention.

C. A. Seley (C. R. I. & P.): I would like to suggest an addition. The coupler committee report suggests a vote of thanks to the various railways for courtesies extended them. I believe the thanks of the association are due to all the railways who have contributed in any way, either by material or otherwise, to the work of the coupler committee. That committee has traveled thousands of miles, put in a good deal of time and had expenses which were assumed in large part by their own roads. I therefore suggest that the resolution of thanks include the tender of thanks of the association to all railways participating in supplying material or otherwise to the coupler committee's work.

The motion with Mr. Seley's amendment was carried.

M. K. Barnum (Ill. Cent.): I would like to move a vote of appreciation of the faithful and efficient service of our secretary during the past year. I feel confident in saying that the good order and promptness with which our business has been transacted is very largely due to his efficiency and ability in handling our work.

J. J. Hennessey (C. M. & St. P.): In seconding that motion I want to say that the arbitration committee has probably had more connection with the secretary than anyone else, and he has responded to every call we made upon him, been always prompt on time, and I think the association owes the secretary very much appreciation.

The motion is carried unanimously.

The Secretary: Mr. President and Gentlemen, I certainly appreciate this compliment to me, but I would like to say to you gentlemen that it is a pleasure, and I might say my life work to serve this honorable body. I think it is the grandest institution of the kind in the world.

While waiting for the report of the tellers the following discussion took place.

C. D. Young (Penna. Lines): In the working of the specifications as to truck sides and bolsters, it was brought to my attention that there was no general form or style in our specifications for the association, and it seems to me the time has come when all the valuable specifications we have should be reviewed by some committee under some certain form, so you will know where to look for a particular specification if you want it. It is difficult to determine what is the rejection limit in certain of the requirements, and I would like to make a motion that a committee be appointed, of which the secretary of the association should be a member, to go over all the specifications of the society, and, without changing the form or substance in any way, revise them in some order of form and style. I might say the American Society for Testing Materials found themselves in a similar position this year, and they have found it a valuable thing to have such a committee, and I suggest that this matter be referred to the executive committee for the appointment of such committee.

The Secretary: I think Mr. Young's suggestion is a very good one, and as that will be a part of the records of the meeting, it will be referred to the executive committee.

E. W. Pratt (C. & N. W.): It seems to me that the committee on truck side frames ought to include specifications, or at least limiting strains per square inch, of the arch bar trucks. I do not see why we should be so critical of other styles, and accept everything that is passed to us in arch bar trucks, when we know the failure in that respect is considerable. If we are going to get up a specification and live up to it, and decline to receive cars that are loaded beyond what the public considers safe for a steel side frame, why should we pass over arch bar trucks?

The Secretary: That suggestion will be referred to the executive committee. You will help out the executive committee a great deal by just such suggestions as these you are making now.

E. A. Miller (N. Y. C. & St. L.): The severe weather of the past Winter has very clearly demonstrated that much trouble has been brought about by the weakness of the arch bar truck. Many cars, as we all know, are still equipped with the arch bar truck. This is a matter that can very properly receive careful attention from this association. Another matter that with us has developed an unusual trouble during the past winter is the dropping of brake beams. There was a general discussion here on brake beams, the brake beam head and the brake beam shoe, but the construction of the brake beam is something that should receive very careful attention from the fact that not only on our own road, but from reports on other roads they had very serious trouble and that trouble has steadily increased. I think that is due to a number of causes. The general trend of the operating department is to carry the trains over the road, to spend but very little time on inspection at intermediate points or terminals, so that the little defects that crop out, such as the losing of cutter keys, the losing of bolts and those minor things in the travel of a car several hundred miles bring about these defects of inspection. So, altogether, I think we are losing for the lack of more careful inspection, especially on running repairs of loaded cars and the dropping of brake beams. On our own road there were more than 50 brake beams dropped during the months of February and March, and those brake-beams were not from any one company's cars, but practically from every company's cars that were doing business over our line.

J. F. DeVoy (C. M. & St. P.): I had personal charge of a track that had been below zero weather for 40 to 50 days, and within one mile of track. I have seen track heaved out of level 11 in. It was that condition more than anything that pounded out your trucks, that caused hot boxes by the severe pounding of waste and dropping it away from the axle; and I say for at least 4 months there was no known method of preventing 50 per cent. of the failures you have referred to. I go further and say, whether the traffic department or the car men or any other department be censured or not, nothing could have prevented them. The minute the cold weather left us and the track began to resume its normal condition, the accidents and the failures fell off, and I believe everybody will agree with me that when the weather does not interfere, you do not hear of anywhere as near as much failure as that trouble you speak of. I have seen new tires broken from nothing but severe weather; tires that would have lasted two or three terms, and that would not have failed under ordinary conditions.

F. W. Brazier (N. Y. C.): I would like to emphasize what the gentleman said, and I think a great deal of Mr. Miller's trouble is in the construction of the cars; in addition to the hangers, there should be some form of safety strap or safety chain. We have had the same trouble.

Mr. Schroyer: Many complaints came in to me during this past winter of nuts working loose, and I knew it was the hard condition of the track that was causing the trouble. Now, as to the arch bar truck—there was never iron put together that would stand as much as the arch bar truck, and yet I believe after we have reached a certain capacity of a car with an arch bar truck, that we have gone beyond the capacity of the iron to withstand the strain, and we have to go to some other construction. Now, we use a good many steel trucks on the Northwestern with a great deal of satisfaction, and yet, after long continued use and under like conditions, and under the same percentage of heavy load that the arch bar trucks have been carrying so many years, I think we have got to give the palm to the arch bar trucks until we go to something else.

The following officers were elected: President, C. F. Fuller, Union Pacific; vice-presidents, M. K. Barnum, Illinois Central; D. F. Crawford, Pennsylvania, and D. R. MacBain, Lake Shore and Michigan Southern; treasurer, John S. Lentz, Lehigh Valley. Executive Committee: R. E. Smith, Atlantic Coast Line; C. E. Chambers, Central of New Jersey, and Henry LaRue, Chicago, Rock Island and Pacific.

President Stewart was presented with an ex-president's badge and the Convention adjourned.

A railway is projected in southern Russia to connect the town of Akerman with that of Leipzig on the Southwestern railway, the distance being about 100 miles, and to cost $3,090,000. This line, if carried through, will be of great benefit to the province of Bessarabia.

M. C. B. REGISTRATION.

Cox, W. N., Supt. Mach., Western Ry. of Ala. & Atlanta & West Point R. R.
Dunn, J. F., S. M. P. & M., Oregon Short Line R. R., Chalfonte.
Endsley, Prof. L. E., Purdue University.
Ewing, J. J., Ches. & Ohio Ry., Holbrook.
Kapp, W. F., S. S. & M., R. F. & P. Ry., Marlborough-Blenheim
Manchester, H. C., S. M. P., Dela., Lack. & Western R. R., Marlborough-Blenheim.
Schlafge, Wm., Gen'l Mech. Supt., Erie R. R.
Schnepel, J. H., Chief Draftsman, N. Y. C. & H. R. R. R.
Westervelt, Jos., M. C. B., Retired, N. Y. C. & H. R. R. R.

M. C. B. GUESTS.

Andrews, D., B. & O., Lexington.
Beale, G. M., B. & O.
Beaumont, C. A. Elwood.
Bently, H. T., Chicago & N. W., Marlborough-Blenheim.
Bickley, H. E., Cumberland Valley R. R., Chalfonte.
Billan, Lewis S., B. & O. R. R., Arlington.
Borup, O. V., B. & O. R. R., Kenderton.
Boyer, W. P., Penna. R. R., Elwood.
Braucher, P. S., P. & R., Seaside.
Burton, G. H., P. R. R., Chalfonte.
Burton, W. C., Penna. R. R.
Butts, H. M., N. Y. C., Chalfonte.
Chase, E. P., Pa. R. R.
Cromwell, J. E., B. & O., Kenderton.
Dailey, E. B., U. P. R. R., Traymore.
Dare, John., P. R. R., Roxborough.
Davidson, Wm. W., P. R. R., Wittil.
Davies, H. W., Norfolk Southern R. R., Traymore.
Demorest, George L., C. R. R. of N. J., Dunlop.
Deyot, F., N. Y. C. & H. R. R., Ben Hur.
Dobson, J. D., B. & O., Bouvier.
Engard, Capt. Albert C., U. S. Navy, Bothwell.
Ensign, J. F., (U. S. Gov.) Int. Commerce, Marlborough-Blenheim.
Erb, C. W., P. R. R., Marlborough-Blenheim.
Fleming, Joseph M., P. R. R., Maryland.
Force, H. J., D. L. & W., Chalfonte.
Foster, C. G., P. R. R., Roxborough.
Freeman, L. H., B. & O. R. R., Kenderton.
Fritch, L. C., Chgo. Great Western, Chalfonte.
Germar, Rodolph, Austrian Society of Credit for Land Mortgages, Seaside.
Glass, J. C., P. R. R., 21 Illinois Ave.
Glass, J. C., Jr.
Haig, J. F., Penna. R. R.
Haynes, J. W., Cornwall & Lebanon R. R., Jackson.
Hays, J. L., B. & O., Arlington.
Hebrank, M. M., P. R. R., Biscane.
Hengstler, D., P. R. R.
Herrera, A., National Rys. of Mexico, Traymore.
Hill, J. P., P. R. R., Marlborough-Blenheim.
Holst, William A., Union Tank Line Co., Young's.
Hughes, S. W., The Washington Terminal Co., Craig Hall.
Ingersoll, G. R., Lake Shore, Shelburne.
Johnson, R. E., Canadian Pacific Ry., Young's.
Josias, Herman, Cuba R. R., Shelburne.
Killian, W. J., P. R. R.
Kniter, G. G., P. R. R., Maryland.
LeCompte, J. V., B. & O. R. R., Lexington.
Lentz, Robert P., Lehigh Valley, Dennis.
Lewis, M. N., Oklahoma Central Ry.
Little, D. A., P. R. R., Dunlop.
Lively, B. F., South Ry.
Lowmann, H. F., Southern Ry., Traymore.
Macklin, H. C., Seaboard Air Line, Haddon Hall.
Macklin, Harold H., Seaboard Air Line Haddon Hall.
Marshall, C. V., Sr., P. R. R., New Strathaven.
Marshall, C. V., Jr., P. R. R. New Strathaven.
Marshall, T. B., P. R. R., Chelsea Hall.
McFarlane, H. B, A. F. & S. F.
Miller, B. E. D. L. & W. R. R., Young's.
Moriarty, G. A., N. Y., N. H. & H. Arlington.
Myers, C. H., Penna. R. R., Elwood
Parker, C. F., Illinois Central, Marlborough-Blenheim.
Phillippe, B. Pemberton, P. R. R. Shelburne.
Philpot, J. N. Y. C. & H. R. R. Co., Pennhurst.
Porter, C. D., P. R. R., Shelburne.
Powell, James, Grand Trunk, Young's.

Randolph, J. L., B. & O. R. R., Shelburne.
Raquet, E. H., N. Y., W. H. & H., Marlborough-Blenheim
Reusct, H. E., C. R. R. of N. J., Granville.
Robbins, F. S., P. R. R., Haddon Hall.
Robins, J. B., C. R. R. of N. J., Edison.
Rogers, S. M., Elgin, Joilet & Eastern Ry., Marlborough-Blenheim.
Rose, Chas. H., Penna. R. R., Tennessee.
Ryer, F. A., Boston & Albany R. R., Shelburne.
Sandhas, H. L., C. R. R. of N. J., Schlitz.
Schlatter, Louis H., P. R. R., Boscobel.
Sheldon, W. S., N. Y., N. H. & H. R. R., St. James.
Strattan, G. E., P. R. R., Marlborough-Blenheim.
Train, A. H., N. Y. Central, Pierrepont.
Vorback, A. S., B. & O. R. R., Lexington.
White, Geo. D., P. R. R., Marlborough-Blenheim
Whiteman, Harry, Penna. R. R.
Whitsitt, Wm. B., B. & O.
Wight, S. B., New York City, Marlborough-Blenheim.
Wilson, L. M., P. R. R.
Wybel, Wm., National Rys. of Mexico, Traymore.
Young, J., Jr., P. R. R., Craig Hall.

THE CHILLED IRON CAR WHEEL UNDER FIFTY TON CAPACITY FREIGHT CARS.

Chicago, June 5, 1912.

To the Editor of the Railway Gazette:

The purpose of this article is to show, by actual performance records, how well the standard chilled iron car wheel has served under heavy capacity, 50-ton, freight cars.

There have been so many statements made for the purpose of making inroads on the standard chilled iron car wheel business, and particularly with reference to the use of this wheel under cars of heavy capacities, that an actual analysis of a miscellaneous lot of wheels(some of which have been in service six years) will show that this wheel has not only given a satisfactory account of itself, but that the possibilities of future increases in car capacities have no significance, because the chilled iron car wheel will perform equally well under even heavier cars than are in use to-day.

Attention is first called to the development of the freight car from 10 tons to 50 tons. Previous to 1875, the maximum freight car capacity was 10 tons; from 1875 to 1884 it was 25 tons; in 1886, 30 tons; in 1896, 40 tons; from 1901 to the present time, 50 and 55 tons. Comparatively few cars in service are of over 55 tons capacity.

The wheels designed to carry these cars were as follows: 10-ton car, 525-lb. wheel; 25-ton car, 550-lb. wheel; 30-ton car, 600-lb. wheel; 40-ton car, 650-lb. wheel; 50-ton car, 700-lb. wheel.

It was not until the year 1909 that the Master Car Builders' Association changed its standards for 30, 40 and 50-ton capacity cars as follows: For 30-ton capacity car, 625-lb. wheel; for 40-ton capacity car, 675-lb. wheel; for 50-ton capacity car, 725-lb. wheel.

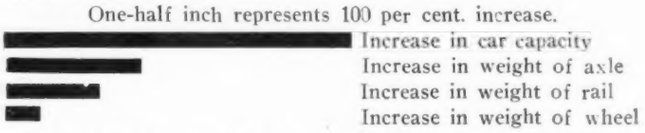
Particular attention is called to this fact, because the wheels that are now being furnished according to the Master Car Builders' Association recognized standard, adopted during 1909, were first applied during 1910. Therefore, the statement which I will submit will be principally for wheels furnished under 50-ton cars prior to 1910, which were the regular 700-lb. wheels. Wheels furnished in 1910 and subsequently thereto weighed 725 lbs.

During the rapid development of the freight car from 10 tons to 50 tons, all parts of the car have been increased in weight, and the rail also, but no part of the car or rail has shown such a slight increase as the chilled iron car wheel.

Note the following showing a comparison of the 10-ton capacity cars with cars of 50-ton capacity:

	Per cent. Increase.
Car capacity, increase 10 tons to 50 tons...	400
Weight of axle, increase 350 lbs. to 870 lbs.	149
Weight of rail, increase 50 lbs. to 100 lbs...	100
Weight of wheel, increase 525 lbs. to 725 lbs.	38

The following diagram shows the relative increases in car, axle, rail and wheel:


One-half inch represents 100 per cent. increase.
Increase in car capacity
Increase in weight of axle
Increase in weight of rail
Increase in weight of wheel

Note that the standard wheel for 50-ton capacity cars up to the year 1909 weighed 700 lbs., an increase of 33 1-3 per cent.

According to the Interstate Commerce Commission report for the year ended June 30, 1910, there were in service about 383,000 freight cars of 50 tons capacity, which would represent about 3,000,000 wheels.

Attention is directed to the following statement which represents the performance of about 22 per cent. of all the wheels in service under fifty ton cars. The record of the performance of the balance of the wheels in service is not accessible.

	Shipments.	*Replacements.*	*Per Cent Replaced.*
1906	167,207	2,861	1.7
1907	165,110	1,318	.8
1908	76,117	793	1.0
1909	78,256	890	1.1
1910	105,654	258	.2
1911	84,894	19	..
Total	677,238	6,139	.9

It will be observed that out of a total of 677,238 wheels shipped, there were 6,139 wheels removed which were defective and which the makers were compelled to replace.

An analysis of the replaced wheels shows that replacement was for the following causes:

Worn tread	1,028
Shell out	1,987
Cracked plate	2,197
Seam	531
Broken flange	86
Broken rim	105
Broken	8
Miscellaneous defects	197
Total	6,139

It is well known that the flange of the chilled iron car wheel has not increased proportionately with the balance of the wheel, and this has been because the Master Car Builders' Association have been confined to limits of track clearance. Notwithstanding this, it is interesting to know that the flange failures are comparatively few.

This statement shows total shipments of 677,238 wheels, there having been removed on account of broken flanges, 86 wheels, or one wheel in every 7,875 wheels shipped; and it must be remembered that not every broken flange is due to an inherent defect in the wheel, because there may be many contributing factors over which the makers have absolutely no control, as in the cases of defective frogs, crossings and rail. Furthermore, faulty inspection may be a contributing factor, as sometimes a wheel may be allowed to wear too much before being removed; the strength of the flange is consequently decreased. Furthermore, it must be remembered that the flange of the wheel furnished prior to 1910 was not as strong and serviceable as the one now being supplied under the Master Car Builders' Association standard recommended in 1909.

In analyzing the performance of this lot of wheels under 50-ton cars, it must be remembered that all of the wheels are sold under a minimum guarantee time service of four years. The makers will, therefore, have to consider further replacements of wheels sold during the years 1908 to 1911, inclusive, but the wheels sold during 1906 and 1907 have practically fulfilled their guarantee as far as the manufacturers' liability is concerned, and a very large part of those sold during 1906 and 1907 are still in service.

A separate analysis of the wheels sold during the years 1906 and 1907 will give an actual demonstration of the performance of the wheels, and, therefore, attention is directed to the following:

	1906	*1907*
Total shipped	167,207	165,110
Replaced account worn tread	498	233
" " shelled out	1,094	431
" " cracked plate	896	327
" " seam	186	214
" " broken flange	48	21
" " broken	1	2
" " broken rim	31	41
" " miscellaneous defects	107	49
Total replaced	2,861	1,318
Percentage replaced	1.7	.8

While there may have been isolated cases where wheels have not given satisfactory service under some classes of 50-ton cars, the record of the performance of this lot of wheels ought to silence those who question the limitation of the service of the chilled iron car wheel, and, if in the future it may be advisable to increase the capacity of the car still further, the chilled iron car wheel can be relied upon to safely carry loads up to 125 tons capacity.

ASSOCIATION OF MANUFACTURERS OF CHILLED CAR WHEELS.
By Geo. W. Lyndon.

SUPERHEATERS AND LOW OPERATING COST.

In the recent reports of railways, the reduction in the cost of transportation in some cases has been sufficient to provoke an investigation of the causes for the decrease. In one case in particular inquiry was made as to the means by which the increased cost of labor employed, in train movement particularly, was partially or wholly offset. This inquiry has brought forth the information that the adoption of superheaters on the locomotives had made possible an increase in capacity per locomotive thus making it practical to haul more cars per train, with a reduced cost per train mile. It has also shown a large saving in engine mileage, brought about not only by the longer trains, but by eliminating the necessity, in many cases, of double-heading.

Individual cases, illustrating the fact that the superheater has reduced the necessity of double-heading, may be found in considerable numbers. With a superheater locomotive it is often possible to handle, in passenger service particularly, from 2 to 4 more cars over the ruling grades than was possible with saturated engines of the same class. The superheater locomotive has, in addition to hauling this greater number of cars, proved itself capable of maintaining a faster schedule with the larger train than the saturated engine could maintain with 3 or 4 cars less.

These facts, together with the continuity of operation of superheater engines, resulting in fewer engine failures, have materially reduced the cost of transportation on roads where the engines are extensively equipped with superheaters.

ELECTION OF EXECUTIVE MEMBERS, SUPPLY ASSOCIATION.

The election yesterday morning for four members of the executive committee of the Railway Supply Manufacturers' Association for the first, second, fourth and seventh districts, each to serve a term of three years, resulted as follows:

First district, Fred. M. Nellis, Westinghouse Air Brake Co., Boston, Mass.

Second district, Oscar F. Ostby, Commercial Acetylene Co., New York.

Fourth district, J. C. Whitridge, Buckeye Steel Castings Co., Columbus, Ohio.

Seventh district, S. M. Dolan, American Car & Foundry Co., St. Louis, Mo.

ASSOCIATION OF RAILWAY ELECTRICAL ENGINEERS.

The semi-annual meeting of the Association of Railway Electrical Engineers was held at the Hotel Dennis, Atlantic City, June 14, and finished with a one day session. There were about fifty members in attendance. This summer meeting was held at the time of the M. C. B. convention so that the members could hear the report of that association on Train Lighting, hear the discussion and see the exhibits of electrical apparatus relating to train lighting.

The morning session was occupied first with regular routine business, including the address of the president, F. R. Frost (A. T. & S. F.), and the report of the secretary and treasurer, Joseph A. Andreucetti. The Electrical Testing Laboratory of New York sent an invitation to the members to visit it, which was accepted by about half a dozen. The executive committee decided that the next meeting would be held at the Auditorium Hotel, Chicago, October 21-25. The committee reports were preliminary and not complete. They are simply an indication of what may be expected in the reports at the October meeting.

E. J. Cartright, chairman of the Committee of Standards, reported that it is working on standards for ball bearings for the generator axle, for shafts and pulleys, and for lubricants. Nineteen of its recommended standards have been adopted by the M. C. B. Association. A motion was unanimously carried in opposition to clause 12 in the proposed standard of the M. C. B. Association, which will be submitted to their letter ballot. This relates to the fuses in the generator circuit, which are not regarded by the Electrical Engineers' Association as necessary. In the discussion of this report it was pointed out that the dynamo suspension for car lighting is not satisfactory and should be standardized, and the trucks should be designed with special reference to the mounting of the dynamo. Another member reported that steel postal cars were being so designed with deep center sills that only 4½ in. clearance can be obtained between the dynamo and the top rail and the proposed standard provides for 6 in. clearance.

The Committee on Car Illumination will report in October on the lighting of postal cars and on the lighting of railway shops and stations. It will present an elaborate report of about 150 pages on the car lighting practice of the Baltimore & Ohio. The question was raised as to how funds would be provided for the expense of publishing such large reports, and the subject was referred to the executive committee.

J. R. Sloane made a preliminary report on specifications, and said that it was expected to present specifications for rubber belting, for incandescent lamps, and for wire for electric conductors.

F. E. Hutchinson said that the train lighting report would be principally concerned with battery charging and the organization of the men at large terminal stations where this

work is done. The committee had found that for regulator and dynamo inspection two men could inspect 15 cars in a day of 10 hours.

The Committee on Insulation of Wires in Railway Buildings reported progress.

At the afternoon session A. I. Totten, of the General Electric Company, discussed the subject of electric equipment for railway shops and said that the alternating current motors can be adapted to the bulk of the requirements, including cranes and transfer tables, the principal exception being motors for variable speed tools, and at present quite a number of machine tools are built so as to provide sufficient speed changes by gearing without the necessity of a direct current motor. Planers, however, require a direct current motor on account of the necessity of high speed acceleration, and it is not probable that the work can be accomplished by an a. c. motor for some years to come. At the General Electric Works a number of planers are now driven by a reversing motor, and in the exhibit of the Niles-Bement-Pond Company on the pier, there is a planer driven by a reversing motor. It is found that there is an increased output of 25 per cent. due to the use of this type of motor on planers. Mr. Totten referred to the general design of railway shops, and said that they were not always best, as the type of erecting shop was usually due to the personal preference of the superintendent in charge. The Seaboard Air Line shops combine the advantages of the longitudinal and cross track types by the use of a separate shop for removing locomotives from their wheels. This scheme has also been adopted by the Chicago & Northwestern at its new Chicago shops.

The specifications for railway electrical equipment often impose impossible conditions and the requirements should therefore be standardized to some extent. For example, there is no general agreement in regard to the temperature limit and overload for generators, and railway requisitions should follow the recommendations of the American Society of Electrical Engineers. In the power plants for large railway shops the reciprocating engine has become almost obsolete. Turbines are now quite generally used and the total cost of the turbine and generator is less than that of the cross-compound engine and generator. Where the older shops have been equipped with direct current motor and reciprocating engines, in some instances the current for extensions has been provided by the use of exhaust turbine using the waste steam from the reciprocating engine.

Returning to the motor for tools, Mr. Totten said that the automatic stopping and starting of d. c. motors is found necessary on account of the rough usage they get when such fixtures are not provided, and on most new equipment push button control is now used for starting machinery and it is sold at a comparatively low price. For driving wheel lathes the hard spots in the tires often require a rapid change in speed, and devices for accomplishing this electrically are also in use.

In regard to wiring of shops, the general practice now is to use conduits throughout. For shop lighting the carbon arc lamp is now obsolete and present methods employ the flaming arc lamps and the filament lamps. Mr. Totten's suggestion from the manufacturer's point of view was that if equipment is ordered without full knowledge of the latest improvements which the manufacturers provide, only standard equipment will be obtained, and it would be an advantage by possible conference with the manufacturers' engineers to obtain improved equipment which would include the later refinements.

The same subject of electrical shop equipment was also discussed by F. H. Herszsh, of the Westinghouse Electric & Manufacturing Company, who said that it was often a question whether it was best for the railways to put up an expensive power house for generating current or to purchase it from some other central power plant. This would avoid a large investment for the building and equipment, the service would be reliable, and there would be simplicity in the bills for the power supply and the bookkeeping would be easier to check. It would then be easily possible to compare the power consumption with the locomotive output at various times. In car shops the tools required for steel cars are usually of variable speed and require direct current motors, and this is true to the extent of 40 to 50 per cent. of the total power consumption.

The numerous advantages of direct driven tools were pointed out. They avoid the loss due to the friction of driven shaft, the elimination of belts and the loss due to their slipping, and numerous other troubles found with belting, especially the accidents to workmen. One of the principal advantages of direct drive is the possibility of checking by a graphic meter in the foreman's office the power required for operating tools and the time when they are in use.

Next followed a discussion on car illumination by A. J. Sweet, of the Holophane Company, who spoke at length in a very interesting and instructive manner. He explained the latest views in regard to illumination as applied to power requirements. He said it was the first duty of the engineer to harmonize different requirements. The three major requirements in car lighting are, first, comfort to the passenger; second, artistic effect, and third, efficiency. Ocular discomfort is due to the vision of the light source, but it is not necessary to entirely envelop the lamp, and a bowl shape reflector is often sufficient. Eye fatigue is due also to vision of light and not necessarily to indirect reflected light. The efficiency of lighting in cars is largely effected by the color of the head lining in the upper deck and on the sides of the car and by the windows and dark color finish generally which absorbs large percentages of light; in fact, in railway cars nearly all the conditions are in the direction of maximum inefficiency. He also made the surprising statement that light walls are unfavorable to eye efficiency. The round upper decks of some steel cars now used in this country are more favorable to good illumination than those with the upper deck. For a time it was thought that indirect lighting would be found a very satisfactory improvement for car lighting, but it is found to be only 25 per cent. efficient, and on account of the limited production of light in cars, it is not now regarded as feasible. It depends largely on clean reflectors, and for proper illumination it would require these reflectors to be cleaned every 500 miles run. The advantage of indirect lighting does not lie in the fact that the source of light is concealed but rather to the multiple direction of the reflection.

The minor requirements of car illumination relate to their advertising value and to maintenance. The maintenance cost is affected largely by the expense for reflectors, and the sockets for these should be such that the reflectors can be easily removed and cleaned, and it might be possible to have duplicate sets of reflectors, so that new sets could be put in while the others are being cleaned.

A second paper on car lighting was read by L. Schepmoes, representative of the Safety Car Heating & Lighting Company. This related to the design and location of car lighting fixtures and was an interesting discussion of the artistic features of lamps. Mr. Schepmoes presented nine handsome photographs showing the latest designs for center lamps made by his company. He said that cheap fixtures should be condemned. The appearance of the lighting fixtures is important in day time as well as at night, and the color of these fixtures is important and should not necessarily be the same as the car interior, but some contrasting color in the fixture should be permitted. Lamp fixtures should be carefully designed on artistic lines and excessive ornaments should be avoided. A question of which is best, to locate the lamps in the center of the main deck or in the lower deck, is one upon which there was not general agreement, but Mr. Schepmoes was in favor of center

lamps. The most attractive fixtures in use are those which use the enclosed bowl. With the indirect lighting many attractive effects from an artistic standpoint can be produced, but it is not an efficient method. The importance of proper shades and reflectors is now greater than formerly, because much stronger illumination is used and the intense glare effects produce a corresponding discomfort. Polished surfaces have a bad effect on illumination and should be avoided where possible.

The next subject discussed was the method of axle generator control, constant current against constant potential. This subject was discussed by representatives of axle car lighting companies, and it was pointed out that in the present state of the art it is not possible to adopt either system, that of constant current or constant voltage regulation, and the attempts to effect operation under either condition would fail. Variable speed is a fortunate thing for charging batteries from axle lighting and it remains for the engineer to take advantage of this fact. It introduces effects which must be provided for and both the battery and the generator should be properly protected. It might be best to regulate for the benefit of the battery, but it might not be most economical for the railway or best for the lighting, so that a compromise under present conditions is necessary. Various schemes have been suggested for apparatus which are intended to regulate upon either of these plans, but they have not yet been fully worked out. At present regulation by voltage was decidedly the simplest method. The further discussion of this subject completed the afternoon session and the meeting adjourned.

MEETING OF M. C. B. EXECUTIVE COMMITTEE.

The executive committee of the Master Car Builders' Association met yesterday after the convention adjourned. Secretary J. W. Taylor was re-elected, and F. W. Brazier (New York Central), was named to succeed E. D. Bronner (Michigan Central), on the arbitration committee, Mr. Bronner having resigned from that committee.

The executive committee decided to meet early in July to appoint the committees for the ensuing year, and an attempt will be made during the next year to get the reports out earlier than in the past.

ILLINOIS ALUMNI DINNER.

The following attended the University of Illinois alumni dinner held last evening at the Hotel Shelburne: Gilbert E. Ryder, Locomotive Superheater Company; J. A. McFarland, Chemist and Engineer of Tests, St. Louis & San Francisco; Grant W. Spear, Dearborn Drug and Chemical Works; F. H. Clark, G. S. M. P., Baltimore & Ohio; C. B. Young, M. E., Chicago, Burlington & Quincy; J. A. Kinkead, Parkesburg Iron Company; J. A. McRae, M. E., Michigan Central; George R. Carr, Dearborn Drug and Chemical Works; R. M. Smith, Burton W. Mudge & Company; Prof. E. C. Schmidt, University of Illinois; W. C. Bradbury, O. M. Edwards Company; Frank W. Bunne, Roebling Company; A. A. Hale, Griffin Wheel Company; A. S. Goble, Standard Steel Works Company; Parker G. Stevens, Railway and Engineering Review.

A line is projected from Soochow, on the Yangtse River, China, to Hangchow, the capital of the Province of Chekiang, a distance of 60 miles.

Surveys have been completed from Wuchow, China, to Konghow, on the proposed line from Wuchow to Nanning. Konghow is very near Nanning. The line when completed will be 360 miles long.

TO-DAY'S BASE BALL GAME.

The annual base ball game will be played at the Pennsylvania Railroad's Inlet Park grounds this afternoon at 3 o'clock. The parade will be formed at the entrance to the Million Dollar Pier at 2 o'clock, and will proceed from there up the Boardwalk to South Carolina avenue, where trolley cars will be taken to the grounds.

The committee in charge of the game is composed of George W. Wildin, manager of the eastern team; F. M. Nellis, manager of the western team; Leonard J. Hibbard, Harry S. Hammond, E. F. Chaffee, George R. Carr and J. P. Landreth.

The mascot of the western team will be Master Charles Gossett, Jr., son of C. E. Gossett, general master mechanic of the Minneapolis & St. Louis, and the mascot for the eastern team will be Master Elliott A. Telford, son of Andrew Telford, purchasing agent of the Queen & Crescent.

The batting orders are as follows:

	EASTERN TEAM.
Right field	Clifford Beaumont (B. & O.).
Short stop	Leonard J. Hibbard (L. J. Hibbard Co.).
First base	George W. Wildin (N. Y., N. H. & H.).
Second base	T. P. O'Brian (O. M. Edwards Co.).
Left field	Al Engle (Jenkins Bros.).
Third base	Sheldon C. Potter (Reliance Electric & Engineering Co.).
Center field	Melon C. M. Hatch (D. L. & W.).
Catcher	Arthur W. Byron (P. R. R.).
Catcher	Harry Oviatt (N. Y., N. H. & H.).
Catcher	John Randolph (Franklin Railway Supply Co.).
Pitcher	Harry Bradford (Westinghouse Air Brake Co.).
Pitcher	Harry B. Oatley (Locomotive Superheater Co.).
	WESTERN TEAM.
Short stop	J. E. Tarleton (Union Draft Gear Co.).
Second base	Stanley W. Midgley (Curtain Supply Co.).
Center field	Neil W. Snow (Detroit Twist Drill Co.).
Pitcher	Elmer J. Smith (W. C. Baker Car Heater Co.).
Catcher (or c. f.)	Harry S. Hammond (Pressed Steel Car Co.).
First base	C. L. Schwartz (St. Louis Refrigerator Car Co.)
Right field	H. C. May (C. I. & L.).
Catcher (or 1. f.)	A. J. Odegaard (Spencer Otis Co.).
Left field (or c.)	J. H. McCloy (Zug Iron & Steel Co.).
Third base	J. E. Fleming (National Tube Co.).
Catcher	R. L. McIntosh (McCord & Co.).
Left field	E. B. Van Patten (Murphy Varnish Co.).

The umpires will be: W. E. Cade (Frank A. Barbey Co.), for the East, and George Cooper (Frost Railway Supply Co.) for the West.

T. D. O'Brian will be captain of the eastern team and Harry Hammond of the western team. Our sporting editor interviewed the rival leaders yesterday, and found each in a mood of the most buoyant optimism regarding the merits

of his own aggregation, and of corresponding contempt for the opposition.

Quoth—

Captain O'Brian—I figure the game will go about five innings, although the West may blow up even sooner than that. I have had some trouble holding my men since they saw the line up of the other team; they protest that they signed up to play ball, not to teach the rudiments of it to such unpromising material. But I have persuaded them to come out and act just as if they were playing against nine real ball players. I am particularly anxious to make it look like a regular game, instead of warming up practice. For this reason I shall make it a point to have nine men on the field each inning, instead of using only an infield.

Captain Hammond—I have done my best, by spreading reports of our need of players, to instill enough confidence into the eastern team to insure their coming out to the field, at least. It is now no secret that I have had for months the finest aggregation of ball players ever gathered on this or any other planet. This is a conservative statement, and I make it only after a painstaking study of the history of the game. Their experience in many climes and under all conditions of service is a guarantee of their ability to continue in action under the most trying circumstances. Even though convulsed with merriment at the efforts of the opposing team, they will still play ball.

FOREIGN RAILWAY NOTES.

Construction work will be pushed forward rapidly on the line from Chengtu, China, to Chungkiang, 200 miles. This line will form a portion of the proposed Hankow-Szechwan system

One of the chief features of the present railway policy of the Chinese government seems to be the disposition to take over all railway enterprises which have been undertaken by private capital, but which have been unduly delayed in execution. For example, the recent troubles in the Chekiang railway led the government to step in and announce that it would take over the entire enterprise. The company is reported to have sent a representative to Peking to change the determination of the government, but at last accounts the latter was adhering to its decision. Similar action has been taken in a number of cases, and it has been announced by the board of communications at Peking that all railway-building privileges granted to private interests must be put into operation during the present year or the government will take them over. However, the Chinese gentrymen interested in building roads with Chinese capital find it difficult to raise the money. Unfortunately, the fact that some of the railways already in operation have been ill managed or have been operated under conditions that render it impracticable to secure fair returns on the Chinese capital invested in them is a constant discouragement. That present conditions in the railway situation of China can continue indefinitely is impossible. The pressure from the people in favor of railway construction, taking the country as a whole, is growing. The demands of trade in the interior are becoming more pronounced in favor of rapid, safer, and better communication. Throughout China, particularly in the districts accessible to coast ports, improved means of communication are being brought into use, such as motor and steam boat services on the rivers and canals, and in some localities improved roads and automobile service. These improvements are accentuating the need and the advantage of railways, and public sentiment is slowly but surely preparing for great railway development.—*George E. Anderson, American Consul General at Hongkong.*

Conventionalities.

"Senator" Brazier! How unkind, and to an ex-president.

If in doubt as to the proper way to oil a wheelbarrow, ask Stanley Bullard.

F. M. Egolf, of the Curtain Supply Company, is attending his first convention.

Herman Josias, purchasing agent of the Cuba Railroad, is attending the convention. He is registered at the Shelburne.

The Davis brothers are more famous than they were a year ago; and the best part of it is that they use their own ladder to get there.

The enforced separation of Wilkinson and Jack Turner is really pitiful. Everything possible has been done to pacify "Wilk," but without result.

A. Herrera, purchasing agent of the National Railways of Mexico, is at the Traymore. Mr. Herrera is accompanied by his assistant, William Wybel.

Mr. and Mrs. Burton W. Mudge and Master Burton Mudge, or "Junior," as he is familiarly known, arrived from Chicago Thursday evening, going to the Brighton.

George C. Jerome, president of the Jerome Metallic Packing Company, is confined to his home by illness. He had made all arrangements to attend the conventions.

Miss Nancy Jane Simpson, daughter of William M. Simpson, president of the Railway Materials Company, was married Tuesday evening in Chicago, to Clifford Potter.

Mr. and Mrs. R. J. Evans will be missed during the remainder of the convention. They were unexpectedly called home owing to the serious illness of Mrs. Evans' father.

Grafton Dodd, of the Virginia Equipment Company, was taken with an acute attack of tonsilitis on Wednesday and was compelled to leave for home at once.

D. A. Wightman, formerly manager of the Pittsburgh Locomotive Works, now retired, is among the guests at the convention. He is stopping at the Shelburne.

J. T. Ensign, chief inspector railroad department Interstate Commerce Commission, is attending the meetings of the associations. He is at the Monticello Hotel.

Robert F. Carr, president of the Dearborn Drug & Chemical Works, was compelled to cancel his Atlantic City reservations on account of unforeseen business matters.

We move that the nominations for president and vice-president of the Railway Supply Manufacturers' Association be closed, and that Messrs. Allen and Hegeman be declared elected unanimously.

Admirers of the "Turkey Trot," "Texas Tommy," the "Kangaroo Glide" and other modern classics, will be completely carried away with Stanley Bullard's "Boardwalk Wiggle."

A. E. Ostrander, assistant mechanical engineer of the American Car & Foundry Company, arrived Thursday with Mrs. Ostrander and their two children. They stayed only the M. C. B. convention.

Friends of O. C. Cromwell, mechanical engineer of the Baltimore & Ohio, are glad to see him about again. A bad case of ptomaine poisoning confined him to his home for several weeks this spring. He is now fully recovered.

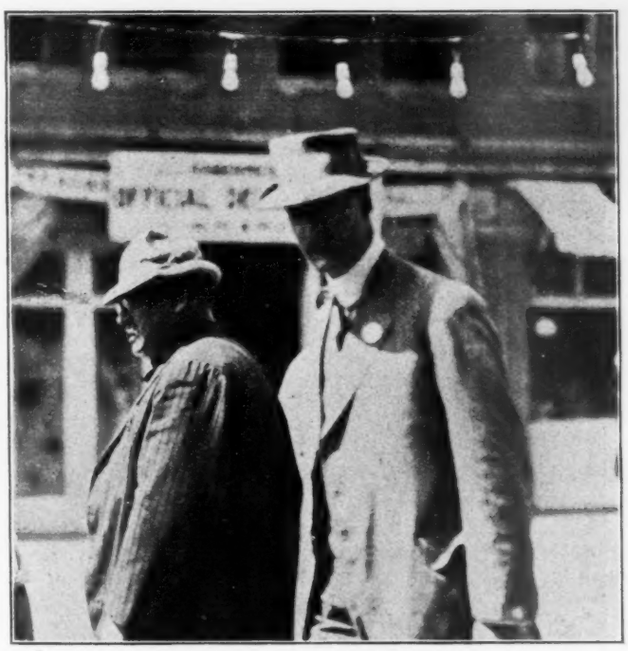
F. W. Brazier talks "turkey trot." He frankly admits that official stenographers generally find trouble in taking down his remarks. After reading in Friday's DAILY what was credited to him on Thursday, he has promised to try to reform

W. M. Barrett, president of the Adams Express Company, registered at the Marlborough-Blenheim Thursday and attended the meeting of the M. C. B. Association. Later

Wells Harris, General Foreman Car Repairs, New Haven, Fleeing from the Camera Man.

in the day he made a rather complete inspection of the exhibits.

W. W. Clements, of the Industrial Works, is very much interested in these, his first M. C. B. and M. M. conventions. He arrived from Bay City, Mich., Wednesday, and will re-



Left to Right—John L. Hodgson, M. C. B. Grand Trunk, and Alfred Copany, Grand Trunk.

main during next week. Mr. Clements is making his home at the Shelburne.

It is strange how far we can sometimes go wrong in sizing up a man. Most of us received a jolt yesterday when C. A. Scroyer modestly affirmed that he had not only never asked for an increase in salary, but that he never started in on a job knowing just how much compensation he was to receive.

Among the special guests is O. S. Beyer, Jr., of the Chicago, Rock Island & Pacific. Mr. Beyer was formerly on the Erie and had a very active part in the lengthy studies that led up to the design of the very powerful Mikado type locomotives which are giving such excellent service on that road.

C. H. Cory, former master car builder of the Cincinnati, Hamilton & Dayton, at Lima, Ohio, sends his greetings to his friends, through THE DAILY, and his regrets that he will not attend the conventions this year. Mr. Corey and family will enjoy the "good old summer time" in the Wisconsin woods.

J. H. Regan, assistant secretary of the Pressed Steel Car Company, arrived Thursday evening. He is staying at the Marlborough-Blenheim. Mr. Regan usually manages to steal away from the conventions within a day or two after

F. W. Brazier, Superintendent Rolling Stock, New York Central.

getting there; but this year it is expected that he will stay until the last gun is fired.

H. M. Perry, known as one of the oldest of the old timers at the convention, was found in tears at the end of the pier on Thursday afternoon. A careful search of the Dailies revealed the absence of official notice of his arrival two days before, hence the dejection of friend Perry. He is here, was here early, and expects to remain until the convention is over.

Henry Gardner, supervisor of apprentices on the New York Central & Hudson River, came down Thursday afternoon with Mrs. Gardner in order to be sure to be present during the discussion of the apprenticeship paper on Friday. In addition to his regular duties, he has been busy during the past few months in putting in a successful schedule at the West Albany shops.

J. D. Murray, from Christmas Island—13,000 miles from Atlantic City—left last night for Winnipeg. He expects to meet his brother-in-law, George McMicken, who has been on Christmas Island for five years, and will go to London with him in July. Mr. Murray will complete a railway 8 or 10 miles long on the island within the next year, and will equip it with a couple of Shay locomotives and 30-ton steel freight cars.

H. T. Bentley, assistant superintendent of motive power of the Chicago & North Western and president of the Master Mechanics' Association, arrived yesterday, accompanied by Mrs. Bentley. Mr. and Mrs. Bentley are at the Marlborough Blenheim. Important business at home kept Mr. Bentley from attending the convention of the M. C. B. association except on the last day.

W. E. Dunham, of the North Western, and Henry La Rue, of the Rock Island, got into quite a heated discussion Thursday evening about the action which was taken on one of the reports that was read on Wednesday. Fortunately a copy of Thursday's DAILY was near at hand, which settled the matter conclusively; and they both shook hands and called the fight off.

When the baseball game ends to-day Stanley Midgly (in his ball uniform "Midge") will have played at the conventions ten consecutive years, in three of which he was captain of the winning Western team. He has played two years at Saratoga, one at Manhattan Beach, and six at Atlantic City;

Left to Right—F. R. Frost, Electrical Engineer, Santa Fe; F. E. Hutchison, Chief Electrician, C. R. I. & P.; Jos. A. Andreucetti, Assistant Electrical Engineer, C. & N. W.

and the indications are that he will keep right on playing as long as the game lasts.

Rodolph Germar, a mechanical engineer connected with the Ringhoffer Car Building Company, Prague, Austria, is attending the convention after a month's trip spent in visiting car building plants in the United States. The company in which Mr. Germar is interested turns out about 3,000 freight and 400 passenger coaches a year. The Ringhoffer works are now running to their full capacity for the first time in several years.

D. P. Kellogg, superintendent of shops on the Southern Pacific at Los Angeles, Cal., is attending the convention for the first time. He came by way of New Orleans and St. Louis and it took him a full week to travel the 4,000 miles. Friends of the two brothers are commenting on the close resemblance in appearance, the most notable difference being that W. L. Kellogg, superintendent of motive power of the Pere Marquette, has a mustache.

C. W. Cross, superintendent of apprentices of the New York Central Lines West of Buffalo, was missed in the discussion of the paper on car department apprentices yesterday. He was prevented from attending the convention because of the illness of one of his sons, which made an operation necessary. The young man is said to be well on the way to recovery. Mr. Cross expects to make a trip to Yellow Stone Park shortly after the season opens.

Clarence Parker, vice-president of the Illinois Central, in

Two of the Old Guard—John S. Lentz, M. C. B. President, 1895 and 1896, and J. J. Hennessey, M. C. B. President, 1902.

charge of purchasers, accompanied by M. K. Barnum, general superintendent of motive power of the same road, made a thorough inspection of the exhibits yesterday morning. Mr. Parker is stopping at the Marlborough-Blenheim and will remain

J. F. Walsh, S. M. P., Chesapeake & Ohio.

several days. The Illinois Central will build 50 Mikado, 20 Pacific and 10 switching locomotives, to be followed by 15 Mikado locomotives for the Central of Georgia.

G. Edmund Strattan arrived Friday and is receiving the congratulations from his friends on his recent promotion to the position of inspector of passenger equipment of the Pennsylvania, with headquarters in the office of the superintendent of passenger transportation, Philadelphia. Mr. Strattan is the son of G. W. Strattan, formerly master mechanic of the Pennsylvania at Altoona. Mr G. W. Strattan, who retired six years ago, arrived in San Francisco June 3, completing a trip around the world.

Fourteen thousand miles of travel to attend the M. C. B. and M. M. conventions is the record, and one that will probably stand for some time. Two natives of Japan have made the journey to Atlantic City and will remain through both conventions. They are Mr. Osawa, mechanical engineer of the South Manchuria Railway, and Mr. Minowa, manager of Mitsui & Company, Ltd., Darien. They attended the convention meetings accompanied by Arthur Haller and Charles Muchnic, of the American Locomotive Company, and Mr. Tesheima, of the railway department of Mitsui & Company, Ltd., New York office.

The following telegram from the superintendent of motive power of the Grand Rapids & Indiana was received by Mr. Gardner in due course yesterday morning and, likewise, in due course, was charged to Mr. Gardner's account with the hotel:

Grand Rapids, Mich., June 13-12.

J. T. Gardner, Marlborough Blenheim, Atlantic City, N. J.:
Refuse to start without protection is promised from Riley, Arp, McCarthy and the other porch climbers. Providing these people are driven from the island, I will come on at once. Buhuoup and McCandless are included in list.

J. E. Keegan.
3:35 A. M."

The question is, where was Keegan at 3.35 A. M.?

L. C. Fritch, chief engineer of the Chicago Great Western, accompanied by Mrs. Fritch, is at Chalfonte. Mr. Fritch came here to attend a meeting of the engineering sub-committee of the Special Committee on Relations of Railway Operation to Legislation. He is chairman of the sub-committee, and the other members are George W. Kittredge, chief engineer of the New York Central; W. L. Darling, chief engineer of the Northern Pacific; and C. A. Morse, chief engineer of the Santa Fe System. The meeting, which was held at Chalfonte at 10 o'clock yesterday morning, was called for work on a report on the rail situation which the sub-committee is preparing for the special committee. Senator Clapp, chairman of the United States Senate Committee on Interstate Commerce, was asked for information as to the number and causes of rail failures and breakages in 1911, and the special committee has been instructed by the railways it represents to furnish the desired data.

S. P. Bush, president of the Buckeye Steel Castings Company, is among the convention visitors. Mr. Bush recently has been taking much interest in the question of federal legislation to permit reasonable agreements between competing railways in regard to rates and competing industrial concerns in regard to prices, and which will also clear up the legal status of labor organizations. He was a witness before a congressional committee that held hearings on the subject a short time ago, and subsequently issued a pamphlet outlining his views. He is a firm believer in, and a vigorous, able advocate of some form of legislation that will legalize agreements which will eliminate cut-throat competition and at the same time be hedged about by restrictions which will amply protect the public against monopoly and its attendant evils. If more business men of Mr. Bush's standing would take the active and intelligent interest that he does in public questions of this kind, instead of leaving them to be dealt with so largely by lawyers and politicians, the results in the long run would be much happier both for business interests and the public interests.

The Exhibit.

The safe ends used by the Oxweld Acetylene Company in its demonstration of flue welding in the acetylene annex at the pier end are genuine charcoal iron supplied by the Parkesburg Iron Company, Parkesburg, Pa.

During the past year large additions have been made to the plant of the Haskell & Barker Car Company at Michigan City, Ind. The additions consist of truck and erecting shops with steel frames and traveling cranes suitable for the construction of steel freight cars; also a new power house with electric generator for light and power transmission. The plant now occupies 150 acres and when in full operation will have a capacity of 100 cars per day. The older shops are well equipped for making wheels, axles and forgings, so that the plant produces all the details necessary for freight car construction excepting couplers, air brakes and springs.

The Edison-Beach storage battery car will be in regular operation, leaving Boardwalk and South Carolina avenue daily, at 10 a. m. and 3 p. m., for Ocean City and return. The car is in charge of R. H. Beach, president, and Le Roy Scott. Special trips may be arranged for those visitors to the convention who desire to make a special study of the car, if they will apply at booth 627 on the pier. The car arrived in Atlantic City Thursday, from Silver Lake, N. J., 175 miles, and made an average speed of 32 miles an hour. The current consumption was 460 ampere hours for the entire trip. This is equivalent to 663 watt hours per car mile, or 33 watt hours per ton mile.

The seamless tube is regarded as necessary for superheater elements, and most of those used heretofore have been cold drawn. The operation of drawing tubes cold is so slow that the product is necessarily more expensive than is that of hot drawn tubes. The principal requirement is, that the tube shall be seamless; and a hot drawn seamless tube should answer all purposes and it can be made much more rapidly. For these reasons the National Tube Company, Pittsburgh, Pa., is now making hot drawn seamless tubes for locomotive superheaters, and they have on exhibition a lot of samples of finished tubes and of pieces which have been severely tested to show the good qualities of this product.

Two trucks, with a new design of cast steel side frames are being shown in the booth of the Scullin-Gallagher Iron & Steel Company, Spaces 153-159. The top half of the journal box is cast integral with the side frame, which gives a truck with a minimum number of parts and from which the bolster or wheels can be quickly and easily removed anywhere, without dismantling the truck. One truck also shows a new method of construction in that the spring plank and column guides are made in one solid steel casting, giving a very rigid truck. There are also on exhibition cast steel truck bolsters, a cast steel double body bolster, a one-piece cast steel six-wheel passenger car truck frame and the Durbin safety coupler.

GOLD THERMOSTAT FOR CAR HEATING.

The Gold Car Heating & Lighting Company, New York, is exhibiting a very simple thermostat for railway car heating. It consists of a hydrostatic transmission of the motion produced by the evaporation and condensation of an exceedingly volatile liquid to the cut-off valve in the supply pipe. The volatile liquid, which is very sensitive to slight changes of temperature, is enclosed hermetically in a narrow space between two corrugated discs. One of these is rigid and

the other flexible, moving in and out according as the pressure, generated by the volatile liquid, rises or falls with the temperature inside the car. The movable disc bears, at its center, against one end of a lever whose other end presses on the center of a smaller disc forming one side of a small hermetically sealed circular chamber, which is filled with a non-freezing liquid. This space is connected with a similar one, whose movable disc has a bearing against the stem of the cut-off valve; and as the liquid flows from one to the other, the valve is opened or closed.

The method of operation is as follows: The thermostatic disc chamber is adjusted by means of a screw so that the movable disc bears with more or less pressure against the transmission lever. This is to adjust the apparatus to maintain the desired temperature in the car. As this temperature rises, the liquid in the regulating disc is volatilized and increases the pressure within. This pushes out the movable disc and, acting on the lever, compresses the disc of the hydrostatic chamber and causes the non-freezing liquid to flow through the small pipe connection to the chamber whose movable disc operates the cut-off valve, causing the latter to close.

As the temperature falls, the volatile liquid is partially condensed, the pressure within the regulating disc falls; the non-freezing liquid is forced back to its original position by the spring tension of the hydrostatic chambers, and the cut-off valve is again opened, admitting steam to the supply pipes of the car.

It is the intention to place one of these thermostats on each side of the car so as to secure an independent regulation, and thus tend to equalize the temperature.

This device is absolutely automatic in its regulation of heat and requires no attention whatever from trainmen.

STEEL COACH INTERIOR FINISH.

The advance in the art of steel coach interior finish is shown markedly in the booth of the Hale & Kilburn Company, Philadelphia, Pa. Among other things, they are exhibiting a finished section of a car now in use on the New York Central Lines, which has the new feature of adjustability, combined with perfect insulation. The recent improvements in metal sash having screwless and interlocking metal beading is also to be found, as well as the latest development in steel coach doors represented in various types, so finished as to be indistinguishable from wood. Various types of the imperial steel frame "Walkover" car seats are shown, including the special standard seats of the Pennsylvania Railroad, Harriman Lines, New York Central, and New York, New Haven & Hartford Systems.

OIL ENGINES FOR WATER STATIONS.

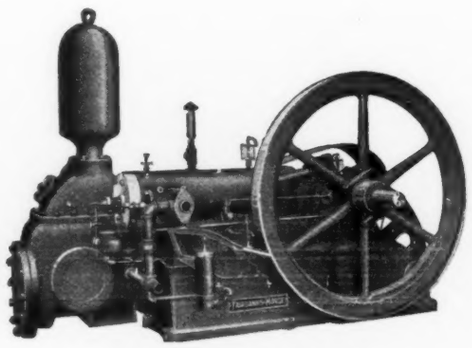
The great economy of engines operating on oil for water station service is illustrated by the following data regarding a short running test made with a 10 h. p. Fairbanks-Morse combined pumping outfit.

No. hours run	7.5
Gal. of water pumped	118,076.5
Water pressure, lbs.	60.
Equivalent head-feet	138.
Gal. of oil used, total	9.989
Gal. of oil used per M. gal. water	.0846
Gal. of oil used per hour	1.332
Gal. of oil used per BHP per hr.	.1332
Cost of oil per hr.	0.0333
Gal. of water pumped per hr.	15,743.5
Gal. of water pumped per min.	262.4
Gal. of water pumped for one cent's worth of fuel	4,727.6
Cost of fuel per gal.	$ .025
Fuel cost per 100,000 gal. pumped	$ .2115

The gasoline engine has demonstrated in many instances that it can easily hold its own with a steam pumping plant even where the cost of fuel for operating the steam plant is quite low. This is largely due to the advantage the gasoline outfit has in the matter of attendance. With the reduction in fuel cost in the case of an oil engine over the gasoline engine, the steam plant is even more heavily handicapped.

Attendance cost with the steam plant must always be heavy, as compared to the plant operating on oil, since the latter is entirely automatic in operation after being started. The waste of fuel in getting up steam, plus the loss after the plant is shut down, also figures against the steam plant. The chief feature is, of course, the very low efficiency of the small steam plant, and unless the fuel cost is very low, this item alone makes its operation costly.

The initial cost of an oil operated combined pump will as a rule, be less than that of a steam plant of equal capacity, and its compactness will make the matter of installation less expensive. From the standpoint of depreciation, figures will in the majority of cases, favor the oil outfit as, with reasonable attention, the yearly cost of repairs, etc., will be small.



Fairbanks-Morse Combined Oil Engine and Pump.

A point that strongly favors the type of engine illustrated is its ability to operate successfully and develop full rated power on nearly 70 per cent. of the refined products of crude oil. This covers fuels ranging from gasoline down through kerosene and into the low grade power distillates.

The fact of greatest significance to the railway man in connection with oil engine operation is the constantly increasing demand for the lighter oils for automobiles, marine engines, etc., which means a constantly increasing production of the lower grade and cheaper oils.

BRASS SASH FOR PASSENGER CARS.

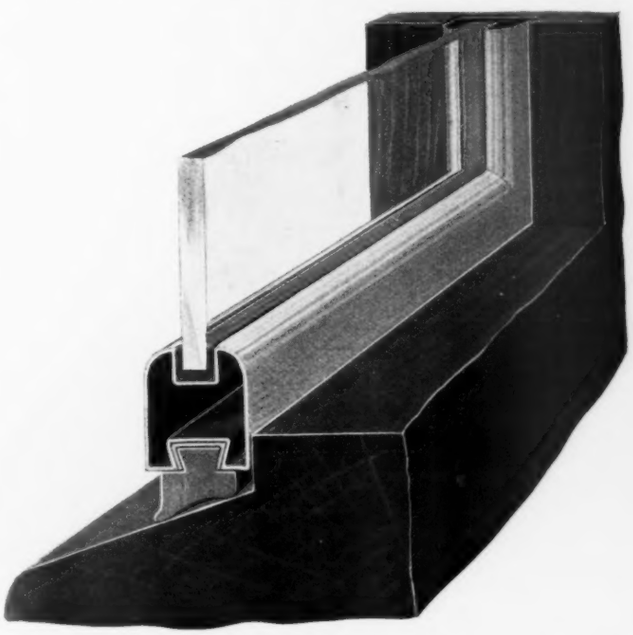
Detailed and accurate figures have been obtained from various railway systems covering the initial cost, together with that of maintenance and replacement, of wooden sash in passenger cars. It was found that during the life of the car, three sets of wooden sash were required, the first sash needed replacing somewhere between the eighth and twelfth year.

At the end of the first year the wooden sash requires only light repairs, including cleaning, revarnishing, reapplying and adjusting in the car. These repairs for the first year run over $25 a car. At the end of the second year the sash are subjected to a general overhauling, including cleaning and revarnishing, the expense amounting to about $50 a car. For five or six years the figures will average from $40 to $65, at the end of which time the sash will have greatly deteriorated and require extensive repairs, including

replacing of parts. These heavier repairs range from $65 to $100. The replacement of the wooden sash at the end of approximately ten-year periods will cost considerably over $200 a car. Taking actual figures, it is found that the total cost of wooden sash in a coach, including maintenance, repairs and replacements, during a period of thirty years, will amount to somewhat over $1500.

In comparison with this, the brass sash now being introduced require little attention. They are oxidized by the atmosphere to a permanent and pleasing finish and do not need varnishing or painting. There is saved, therefore, the cost of removing the sash and replacing it in the car. The brass will not deteriorate like wooden sash, nor become loosened at the joints, and will not become swollen or warped, and do not bind in the window grooves. If brass sash ever become injured in an accident, they possess a very substantial scrap value.

Furthermore, with the brass frame, it is possible to make the rails very much narrower. With the same outside dimensions of sash, therefore, there can be obtained more light in the car. The larger glass also has the effect of adding very materially to the pleasing appearance of the car. If a larger glass is not desired, then correspondingly smaller outside dimensions of window can be used, permitting the use of wider posts between the window openings.



Forsyth Brass Sash with Rubber Bottom Weather Strip.

A perspective and cross sectional view of the bottom of a brass sash equipped with a combined weather and bottom cushion rubber member, is illustrated herewith. This sash is furnished by Forsyth Brothers Company, Chicago. As shown, the upper portion of the rubber is encased in a channel retaining strip. The rubber and its strip are held by a dove-tail insertion in the groove in the lower edge of the sash. It is more difficult to obtain tight and dirt-excluding contact along the bottom of the sash and the window sill than between the sides of the sash and the window grooves. In the latter there are two side walls, around which it is necessary for the air and dust to pass before being able to enter the car, whereas in the former there is only one rear wall and the sill, being on an incline, invites the wind and dirt to shoot up in the car.

The bottom rubber cushion on this sash is provided on its under side with a concave surface, which automatically adapts the sash to any variations in the longitudinal alignment of the sill such as camber of the car, or where the sill is not at right angles to the post, as well as to variations in the incline of the sill.

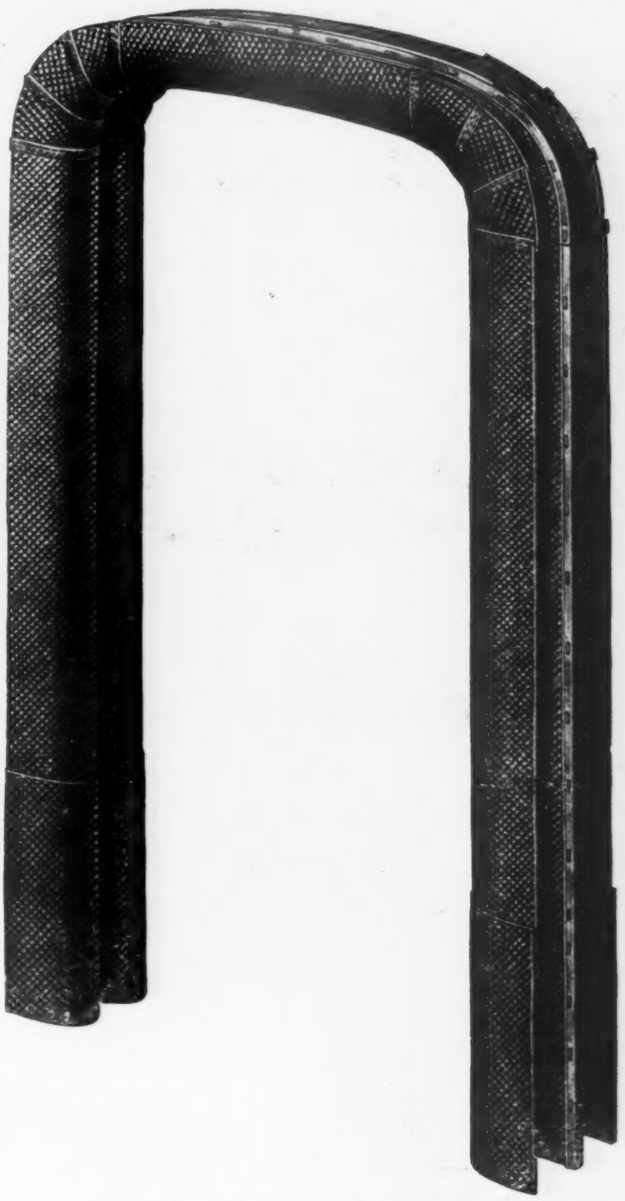
This cushion also breaks the jar of the sash when it is dropped or violently lowered, thereby greatly reducing the glass breakage.

This style of brass sash can be furnished in any shape desired. It is on exhibition at Booth No. 545.

ACME SECTIONAL DIAPHRAGM.

A car diaphragm that does not require a supplemental hood and is made in valleys of U-shape instead of the customary V-shape, thus having no sharp corners to catch cinders and retain moisture, is being made by the Acme Supply Company, Chicago.

The diaphragm is made of heavy three-ply cotton belting



Acme Sectional Diaphragm.

in three sections, one at the bottom of each leg, and the third making up the arch and upper part of the legs. A 20-in. expansion is provided with but two folds, which are bound together by a continuous brass binding around the outside. These two folds are secured by only a single row

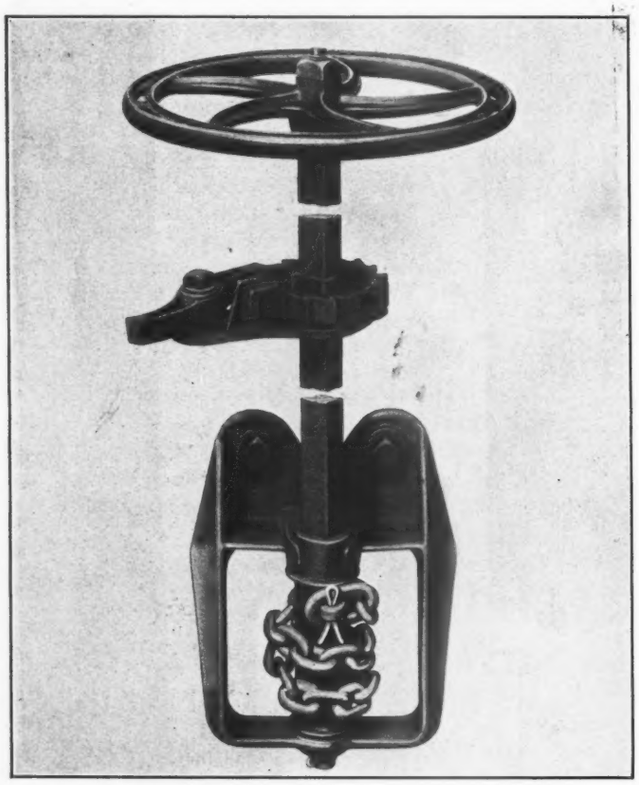
of stitching and the real binding is accomplished by this brass channel, which caps over the edges of the belting. The legs of the channel are rounded out at the extremities so as to prevent any possible cutting at this point. It is securely fastened by large brass staples passing through both legs of the channel and the two pleats. These are bent over on the opposite side and securely anchored, and are located at 6-in. centers.

Instead of using a supplemental hood, this diaphragm is provided with a double thickness at the top. The top piece is made of fireproof and waterproof material, and the whole construction is practically self cleaning by the suction of air caused from the moving train. The boot is 24 in. high and extends 4 in. above the bottom of the leg portion of the diaphragm proper. It is placed inside the leg to provide lap and drainage, and has the warp of the belting running at right angles, thus adding greatly to its strength. It is not rigidly connected to the leg proper and does not have a tendency to draw up from the buffer plate at the inner folds.

This diaphragm is made in either the ordinary Pullman shape or the apex shape, the latter to be used when only one buffer spring is provided. It can be inspected in space 572.

MALLEABLE IRON HAND BRAKE FITTINGS.

The National Malleable Castings Company, Cleveland, Ohio, has recently placed upon the market some new malleable iron brake fittings for both square and round brake shafts. The special feature of these new fittings is their adaptability to both the square and round brake shafts, which gives a more substantial arrangement than is obtained with

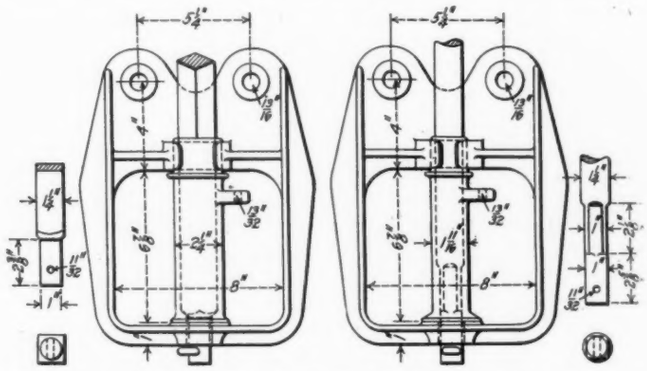


Square Brake Shaft with Malleable Fittings.

the ordinary brake shaft. In considering the advantages of the square brake shaft, the illustrations show the ratchet wheel fitting over the shaft without any pin or keyway to hold it in position. A retainer cast on the ratchet plate holds the ratchet wheel in place, preventing it from rising and thus disengaging the brake pawl. The ratchet wheel may be applied to the shaft at any point, and it is not necessary to machine or weaken the shaft in any way to apply it.

Fewer pieces are necessary with this installation than with the round shaft, and as the wheel bears on the ratchet plate, there is no weight on the brake shaft itself. The brake chain winds on a sleeve that fits over the lower end of the shaft. This sleeve has a square fit on the shaft and turns with it. It is held in place on the brake shaft step by malleable iron lugs which are bent around the upper end of the sleeve after it is put in place. The line drawing shows the work necessary on the end of the brake shaft.

In the case of the round shaft, the ratchet wheel is attached as usual by means of a small key; but a separate



Square and Round Shafts with Malleable Iron Winding Sleeve.

winding sleeve is placed on the end of the shaft as in the case of the square shaft. With this shaft more work is necessary as the end of the shaft is squared, as shown in the illustration, to receive the winding sleeve. However, the principle of reducing the weight and wear of the shaft is the same in both cases. Material used for the round shaft may be taken from any ordinary round iron,, such as old truss rod material, and there is no necessity of keeping any special stock on hand. By using the winding sleeve on the bottom, the strength of a 1¼-in. round shaft is greater than the regular 1½-in. shaft with 9-16-in. hole for the brake chain attachment.

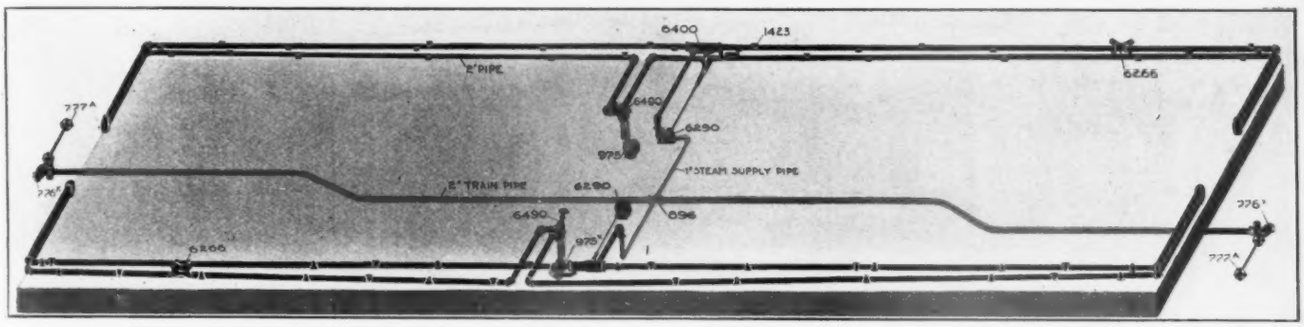
THERMO JET CAR HEATING SYSTEM.

Several new features of the Thermo jet car heating system are shown in the exhibit of the Safety Car Heating & Lighting Company, New York. The claims made for this system are that it saves 40 per cent. in steam and fuel consumption; that it gives a sufficient range of temperature to ensure comfortable car heating with any outside weather conditions; that it saves in the amount of pipe necessary for radiation; and that it reduces the amount of attention necessary to a minimum. In our climate, with its varying changes, a car heating system should be arranged to give a large variation in the amount of heat radiated in the car, and in order to get a range of temperature sufficient for proper car heating, it is necessary to have radiator temperatures varying from 132 deg. to 280 deg. F. It is claimed that the Thermo Jet system gives this large range of radiator temperatures, and that any desired car temperature can be maintained constant, regardless of what the outside weather conditions may be.

The principle of operation is simple; the temperature of the radiators is controlled by the expansion of a portion of the radiator pipe which regulates the amount of steam injected into the radiating system. A valve is connected at a certain point in the system so that as the temperature of the pipe rises sufficiently to expand the pipe, the valve is closed. When the pipe cools by radiation, the valve again opens and steam passes through an injector, and the cycle is repeated maintaining any

predetermined temperature of the car. Iron pipe expands and contracts according to a fixed law, so much per foot per degree, and it is a simple calculation to establish the proper length of pipe for a good valve opening to obtain a desired temperature of radiating surface. The valve opening can be set to any desired point by a simple arrangement with an indicator located at an available point in the car. If the system is set for a low temperature the valve opening is small and enough steam is mixed with the air in the system to give the required temperature.

An admirable modification of this Thermo Jet system is now available for compartment cars, whereby the temperature of each compartment may be regulated by the occupant of the compartment to suit his own particular requirements. This feature should eliminate the objection sometimes raised that the attendant or porter in a compartment car cannot regulate the heating system to give a temperature satisfactory to the occupant of each compartment, owing to the varying requirements of different people.



General Arrangement of Thermo Jet Car Heating System.

STEEL PASSENGER CAR SIDE FRAMING.

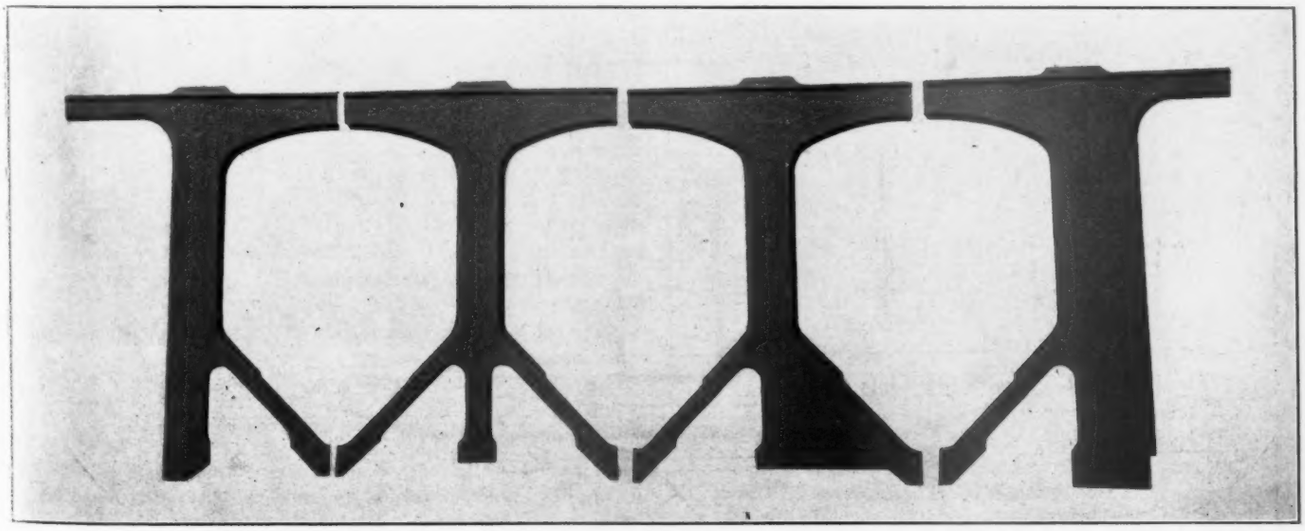
The details of the pressed steel unit panel side truss used on the New York, Westchester & Boston all-steel passenger cars, which were described in the weekly edition of the Railway Age Gazette, of June 14th, are illustrated herewith. Each of these units includes a main post, the diagonal braces, the letter board and the side plate channel. By making these members from one sheet of steel the riveted joints between the parts are eliminated. These unit panels are securely riveted together and form a continuous truss, the depth of which is such as to make the side frame of exceptional strength and rigidity. The panels are pressed from ¼ in. sheet steel, and are riveted together at the top with splice plates, and are butt welded by the oxy-acetylene process. At the bottom they are riveted to the side sill.

This construction is much better adapted to the full utilization of the properties of steel than that of the prevailing designs of wooden passenger cars. For example, a heavy steel belt-rail at the window sills is practically in the neutral axis of the side of the car, if the roof and the letter board be assumed as the compression member, and the side sill as the tension member of the structure. If, however, the belt-rail is assumed as the compression member then the letter board and roof are subject to an appreciable distortion, when the structure is under full load. The elasticity of a wooden structure permits of a considerable deflection without serious damage, but in steel cars the results will be serious if appreciable deflection is permitted.

In the ordinary steel passenger car the load is carried by side girders below the windows. They have an affective depth of approximately three feet. In the side-truss car the effective depth of the girder is about seven feet. The belt-rail in the side truss car is near the neutral axis and consequently only a light sash rest is required. To illustrate one of the advantages of the side-truss, it may be assumed that the side frame is required to resist a moment at the center of 2,000,000 inch pounds; then comparing girders of the heights given above, we have:

Stress on top and bottom members, three feet girder	55,600 lbs.
Stress on top and bottom members, seven feet girder	23,800 lbs.

Thus, it is evident that in addition to the elimination of the weight of the belt-rail, less than one-half as great

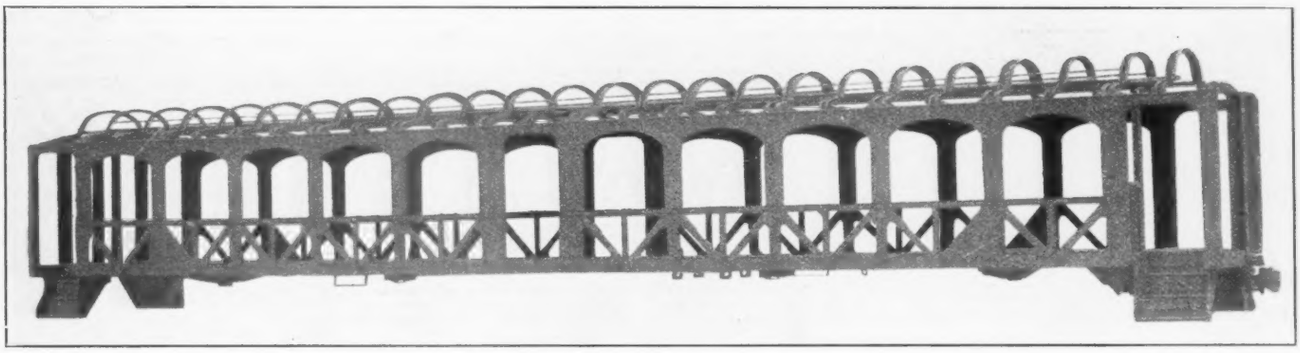


Pressed Steel Side Frame Units of New York, Westchester & Boston All-Steel Cars.

sectional area is required in the side sill of a seven foot girder as in that of a three foot girder for equal fiber stress.

The above example does not take deflection into account. For the purpose of comparison, it may be assumed that the cross-sectional area of the belt-rail and side sill in the three foot girder is 4 sq. in. each, and that in the seven foot girder it is half that, or 2 sq. in. each. Then the deflection of the three foot girder is nearly three times that of the seven foot girder. In actual practice this ratio may be slightly less due to flexure of the posts of the side-truss. However, with the side-truss construction no attention need be given to deflection, whereas in the ordinary type of construction deflection is often the determining factor. The side-truss construction is designed solely for fiber stress, and when thus designed no measurable deflection will take place even under full load.

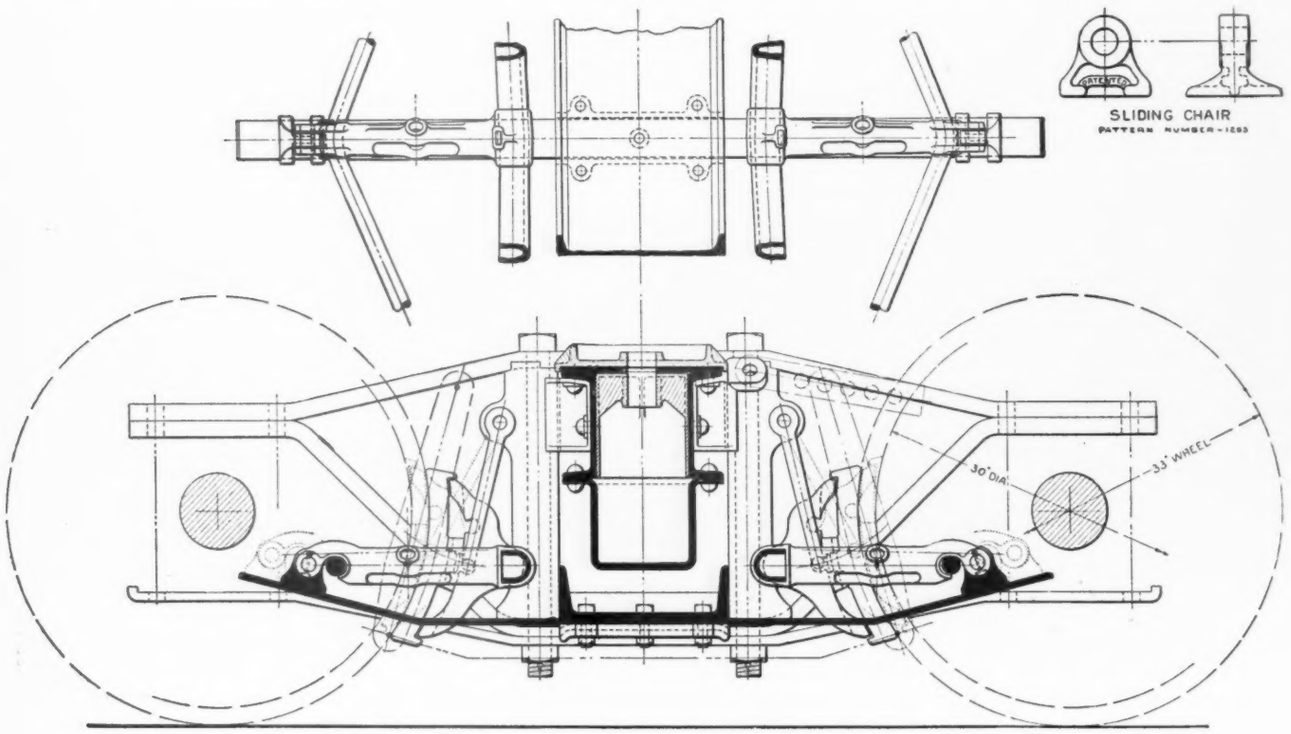
Finally, the side-truss construction saves nearly all the weight of the belt-rail, and approximately one-half the weight of the side sill, when designed for fiber stress alone, and for equal deflection it saves much more, because of weight that must be added to the shallow girder to bring the deflection within the limit. A further saving in weight is effected by the uniform section and center sill construction. The pressed unit side frame material was furnished by Forsyth Brothers Company, of Chicago.



Framing of New York, Westchester & Boston All-Steel Passenger Cars.

CRECO BRAKE BEAM SUPPORT.

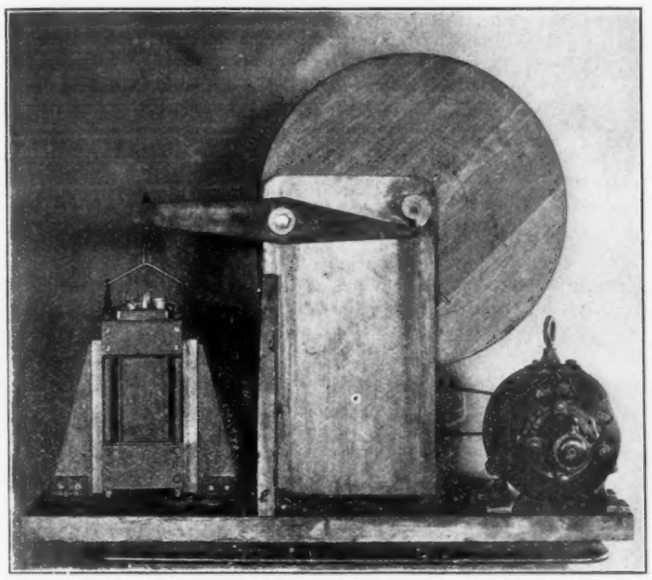
The Creco sliding third point brake beam support and safety device, made by the Chicago Railway Equipment Company, Chicago, is here illustrated. The makers call attention to the fact that this is the only device which provides for the conditions arising from the reduction in diameter of the rolled steel wheels. It has proved in service to add to brake beam safety, and the device maintains a proper relation to the brake beam hangers at all times, and is operative for beams of different strut depths on the same truck. The Creco support prevents the beam from tilting downward and does not pull against the forward movement of the beam when brakes are applied with worn shoes. It does not tie the beam to the flat spring support, and so does not prevent the beam from having such lateral movement as the brake hangers allow. It cannot throw the beam downward in case the underhung spring is bent, and cannot twist it out of place. It does away with the use of the second spring and cotter heretofore used, and permits of cheap and simple spring construction. It has the desired flexibility and broad bearing areas desirable in a device of this kind.



Creco Brake Beam Support.

SEVERE TESTS FOR STORAGE BATTERIES.

When the Edison storage batteries, which are specially fitted for train lighting because of their compact size, light weight, high efficiency and durability, were developed, Mr.



Machine on Which Edison Storage Batteries Were Tested.

Edison insisted that before they were placed on the market they pass successfully the following tests:

One of the batteries was selected at random from a lot of several hundred and was placed in a cage suspended

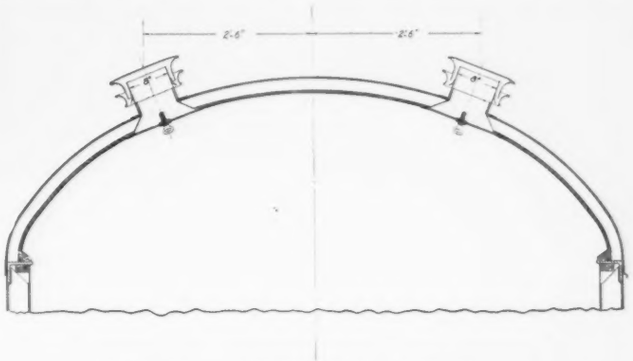
Truck With Edison Storage Batteries Was Projected Against a Brick Wall 500 Times at a Speed of 14 Miles Per Hour.

from a wooden beam, as shown in one of the illustrations. The beam was fulcrumed near its center and the other end bore against the cam attached on the same shaft as the large wheel, which was driven by an electric motor. As the cam rotated the storage battery was alternately raised ½ in. and then dropped on the solid oak base of the apparatus. After the cell had been raised and dropped 1,776,000 times it was tested and showed the same electrical capacity as it had before the test was made.

In another case six of the cells, mounted in a tray, were placed on a truck, which is also illustrated. Special means were provided for projecting this truck against a substantial brick wall 500 times at a speed of 15 miles per hour at the moment of impact, and the batteries were finally perfected to a point where they could stand this violent treatment without suffering injury.

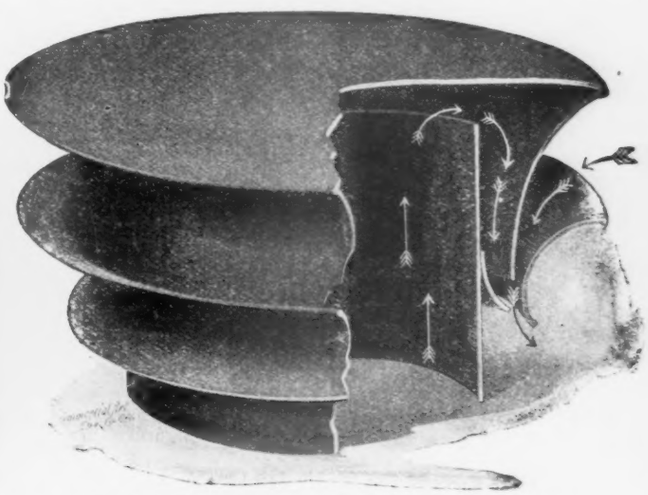
UTILITY EXHAUST VENTILATOR.

The Utility exhaust ventilators shown in the accompanying illustrations are very effective in removing the foul air from a car. The motion of the train causes air to be forced downward between the outer ring and the ventilator body, and this jet action draws air from the interior of the car.



Application of Utility Exhaust Ventilator.

Even when the car is standing still the wind acting on it causes good ventilation. There is no chance for cinders to lodge in the ventilator or between it and the roof and cause the metal to rust out. The ventilator is strong, being made of cold rolled steel, heavily galvanized. The accom-



Showing Operation of Utility Exhaust Ventilator.

panying drawing shows the method of application of about 2,000 Utility ventilators to the new steel cars being built by the American Car & Foundry Company for the Illinois Central. The ventilators are made in all sizes and special lamp jacks for oil and gas lamps are interchangeable with older types. For this service they are most desirable, as

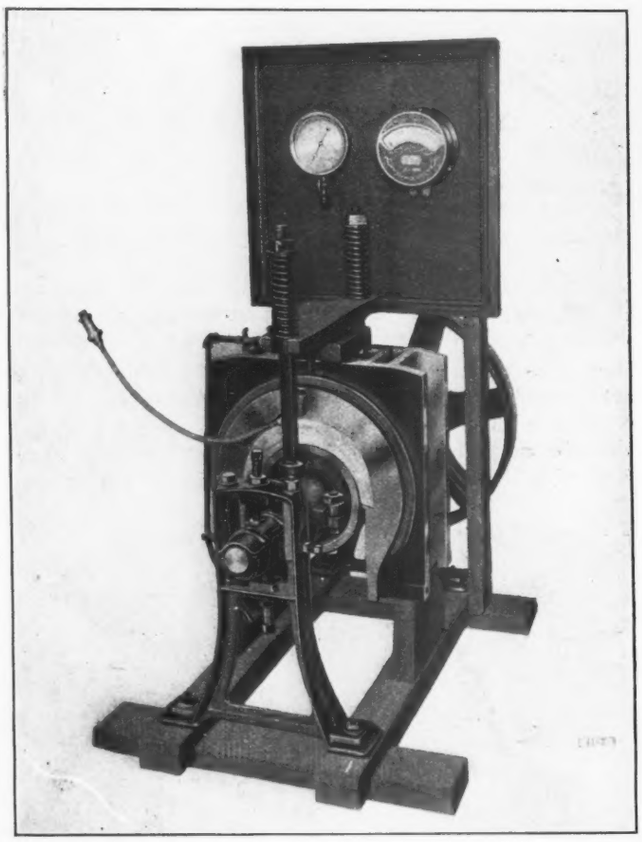
they keep out cinders and carry away the heat rapidly. This ventilator is made by the Railway Utility Company, Chicago.

MACHINE FOR TESTING JOURNAL FRICTION.

A machine for testing the amount of friction between the driving axle of a locomotive and its journal bearing as shown in the exhibit of McCord & Company, Chicago. It consists of a reproduction of a locomotive driving journal actuated by an electric motor connected in series with an ammeter, which indicates the amount of current consumed by the motor in overcoming the friction.

The journal bearing is fitted for the attachment of a McCord locomotive force feed lubricator and a gage is connected to the lubricator, which indicates the pressure on the oil between the axle and the journal brass. An adjustment is provided by which any desired load may be applied to correspond to the weight of a locomotive, supported by one driving journal.

In operation a valve is opened which allows enough oil to flow from the oil chamber in the journal bearing into the pan



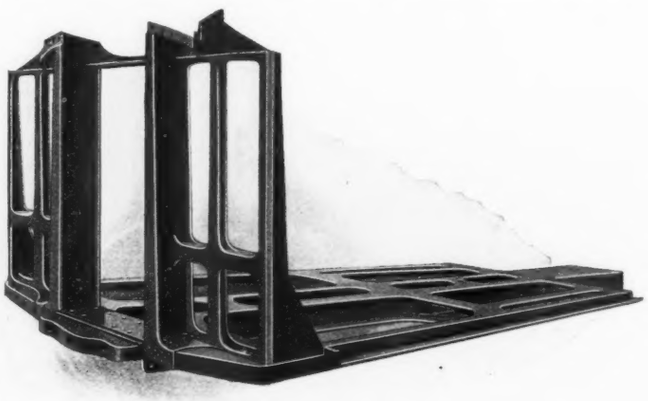
Machine for Testing Journal Friction.

under the machine, reducing the oil pressure to zero on the gage or to the condition of lubrication furnished by any system which relies upon packing a journal box with waste or upon a gravity feed. In other words, the only oil between the bearing surfaces is retained by adhesion and becomes less and less the longer the axle is rotated. The surface of the steel axle is now separated from the journal brass by a very thin film of oil and the reading on the ammeter indicates the amount of current necessary to overcome the friction.

When the relief cock is closed the oil is forced in by the lubricator to any pressure desired within the limits of the machine. The greater the pressure on the oil, the greater is the thickness of the film of oil which lifts the journal brass off of the axle. The greater the pressure of oil the lower will be the reading on the ammeter, indicating a smaller amount of current necessary to overcome the friction between the axle and the brass. When sufficient oil is pumped in so that the brass and the steel do not touch, but each bears on the film of oil, the reduction in current used by the motor is so great as to give conclusive proof of the value of the McCord locomotive force feed lubricator.

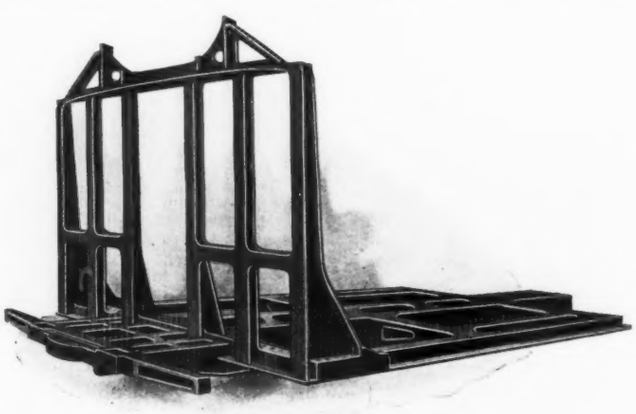
CAST STEEL END FRAMES FOR PASSENGER CARS.

Experience with steel passenger cars in collision where telescoping takes place has shown that the vulnerable part is in the end frame. This fact is recognized in the new specification for mail cars which has been adopted by the Federal authorities. To provide a strong structure at this part of the car, the Commonwealth Steel Company, St. Louis, Mo., has



Commonwealth Cast Steel End Frame for Passenger Car Without Platform.

designed two forms of cast steel end frames, one for passenger cars with platforms, and one for cars without platforms. These end frames are massive steel castings which are intended to be riveted to the Commonwealth cast steel double body bolster, and to the combined platform when required. In this way a strong construction in the end frame is added to that already provided in the cast steel end for the underframe.



Commonwealth Cast Steel End Frame for Passenger Car with Platform.

The connection of these two large castings is made with square abutting shoulders, which provide enormous resistance to shear, so that little dependence need be placed on the rivet section. The end frame casting is designed with proper proportions and economic sections with regard to the relation of strength, stiffness and weight.

Railway Age Gazette

DAILY EDITION

Copyright, 1912, by the Simmons-Boardman Publishing Co.

Vol. 52. NEW YORK—JUNE 17, 1912—ATLANTIC CITY. No. 24c.

PUBLISHED EVERY FRIDAY AND DAILY EIGHT TIMES IN JUNE, BY SIMMONS-BOARDMAN PUBLISHING CO., 83 FULTON ST., NEW YORK.

CHICAGO: 417 South Dearborn St. CLEVELAND: Citizens Bldg.
LONDON: Queen Anne's Chambers, Westminster.

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Subscriptions, including 52 regular weekly issues and special daily editions published from time to time in New York, or in places other than New York, payable in advance and postage free:

United States and Mexico	$5.00
Canada	6.00
Foreign Countries (excepting daily editions)	8.00
Single Copies	15 cents each

Engineering and Maintenance of Way Edition and the four Maintenance of Way Convention Daily issues, North America, $1.00; foreign, $2.00.

Entered at the Post Office at New York, N. Y., as mail matter of the second class.

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THE twenty-fifth annual convention of the American Railway Master Mechanics' Association was held at Saratoga 20 years ago, with a membership of 511. The president was John Mackenzie, and the secretary Angus Sinclair. The proceedings dealt largely with locomotive testing, one report relating to standard methods of testing locomotives; another was on tests of compound locomotives, and related to tests of a Vauclain compound compared with a simple engine of similar type on the Chicago, Milwaukee & St. Paul. This led to a lengthy discussion which brought out the accounts of the performance of the various types of compound locomotives then in use, and while these were, as a rule, favorable to the compound locomotive, the general opinion as expressed by members was not favorable to it. The meeting was not particularly notable, excepting for this report and the discussion on compound locomotives.

THE special facilities, organization and methods required to properly take care of Mallet locomotives at terminals is a subject that seems to be of sufficient general interest and importance to justify the Master Mechanics' Association in appointing a special committee to investigate and report at the next meeting. The service of these very large locomotives is affected more seriously by lack of attention at terminals, than locomotives of any other type. Not only are they usually compounds, which alone means extra attention if the full benefit of the compound feature is to be obtained, but boilers of the size generally used need the most careful inspection and a high character of workmanship in repairs. The importance of this feature seems to increase in even a greater ratio than the increase in size. Some roads are maintaining the Mallets in practically perfect condition while others have not yet solved the problem of doing it. At some points there are rather elaborate facilities for the work and at others no special arrangements are found necessary. Some engine houses have a special gang used exclusively for work on Mallets, others use the regular workmen as they may be at liberty. There are good and also indifferent results from both ways and it would seem advisable to have the subject studied and a report made which would give the members at least a few general principles which should be followed and permit an open and free exchange of experiences during the discussion.

UNDER the heading "CAR BUILDERS HAD BRILLIANT BALL. Million Dollar Pier Scene of Beauty and Splendor Last Night," the Atlantic City *Evening Union* of Friday thus described the informal social gathering of the M. C. B. Association held on Thursday night last: "Delegates to the Master Car Builders' Convention enjoyed their annual hop on the Million Dollar Pier last night. The function was the most brilliant in the history of the association, fully a thousand members and their ladies being on the floor at one time. Decorations were unusually elaborate, including potted plants of every description, with hundreds of dollars' worth of American Beauty roses going as souvenirs of the occasion. * * * * Gowns worn by the women were exquisite." Sorry we weren't around when the roses were passed. The sort of stuff we have quoted from the Atlantic City *Evening Union* is the kind that makes railway men and many other people think that some newspapers don't care a rap whether they print facts or the opposite. The truth is, as everybody attending the convention knows, that there is a special effort this year to make all entertainment features as informal as possible; that there was no ball last Thursday night, but merely an informal dance; that there were no special decorations at all; that not a dollar's worth, or a penny's worth, of American Beauty roses were given away as souvenirs; that members of the entertainment committee and many other men appeared in their street clothes, and that the number of "exquisite" gowns worn by the ladies was unprecedentedly small. The thing is, of course, a small one but it merits serious comment as illustrating the tendency of many newspapers to publish in regard to more serious railway matters not what actually happens but what ought to have happened in order to make a good newspaper "story." If any other man or woman who had attended that dance had gone away and told what the newspaper reporter told he or she would have been called by that "ugly and shorter name." What makes falsehood, when published in a newspaper, one thereby told to many people, anything different from the lie that is told only by one person to one other person?

LUBRICATION OF LOCOMOTIVE CYLINDERS AND VALVES.

THE use of superheat in locomotives has incidentally brought about important improvements in cylinder and valve lubrication. These relate not only to the methods employed, but also to the quality and quantity of the lubricants. The number of lubricators has been reduced and local applications of the lubricant have been almost abandoned. The new principle is based on general lubrication of both valve and piston by converting the heavy valve oil into a fine spray by means of an atomizer and introducing it in the steam pipe near the steam chest. This method has proved to be very satisfactory in connection with the use of superheated steam.

The black coating often seen on cylinders was formerly regarded as the result of the burning or carbonization of the valve oil, and with superheated steam its presence was accepted as proof of the necessity of more lubricant and of a higher fire test oil. It has been demonstrated that the largest proportion of this deposit comes from the smokebox gases which are drawn into the cylinder when drifting. It has been further shown that the improved valve oils for use with superheated steam will not carbonize at 800 deg. F., and to avoid this black coating some other remedy should be applied beside more oil and a higher fire test. If the throttle is left slightly open, or a drifting valve is used when descending grades, the small steam flow will prevent the suction of gas and sparks into the cylinder and at the same time supply a slight lubricant which will prevent cutting and save packing rings. While this fact has been known for a long time, little advantage has been taken of it in locomotive practice, and it has remained for a lubricating oil company to again point out the importance of the use of a light flow of steam through the valves and cylinders when the engine is drifting. The Lake Shore has used with advantage on superheater engines an automatic drifting valve which accomplishes the same purpose, by opening when the throttle is closed. It is found also that when air and smokebox gases are admitted to the cylinder they dry up the lubricant, while if steam is present this action does not take place. The results of the improved lubricating methods now in operation are showing large savings in the amount of valve oil used, and those directly in charge claim that less than half the oil is now required and the valve and cylinders are kept in better working condition.

RAILWAY ELECTRICAL ENGINEERS.

WHILE the car builders were in session on Friday another meeting with allied interests was being held at the Hotel Dennis, and in the issue of THE DAILY for June 13 was given a report of the semi-annual meeting of the Association of Railway Electrical Engineers. On the same day a meeting of Railway Chemists and Testing Engineers was held at the Chalfonte Hotel. Atlantic City is also the usual meeting place of the American Society for Testing Materials, and in former years it held its sessions immediately after the adjournment of the mechanical conventions. The concentration of these meetings of mechanical societies at Atlantic City at the time of the railway mechanical conventions shows the interest which these men have in the application of science to railway equipment and the manufacture of railway materials. These societies are of comparatively recent origin, and for the first 35 or 40 years of American railways the civil engineer was the only technically educated man employed. The older railway mechanical officers can remember when there was no railway testing room or chemical laboratory nor specifications for materials used in railway shops.

The first railway testing laboratory was established by the Pennsylvania Railroad at Altoona, in charge of Godfrey W. Rhodes. Then followed the chemical laboratory in charge of Dr. C. B. Dudley, and soon after those of John W. Cloud and Richard H. Soule. These men formed the first railway technical club, with headquarters in their rooms at the Logan House, and the application of science to the mechanics of railways and to the preparation of specifications for railway materials thus made its beginning in the early days when iron and steel manufacture and locomotive and car building were growing too important for rule-of-thumb methods.

The Association of Railway Electrical Engineers is the youngest of these technical societies which is directly interested in railway equipment. Starting as a society of electric car lighting engineers it performed valuable service in developing electric car lighting to such a point that it is now considered almost an essential of satisfactory passenger service. Having accomplished this it is now concerned in standardizing the equipment and in perfecting its operation so as to make it more efficient and economical. The society soon found that its activities need not be limited to electric car lighting, and it broadened the scope of its interests so as to include all the different classes of work which the railway electrical engineer directs, and the name of the society was changed accordingly. It is now largely concerned with the lighting of offices, stations, yards, round houses and shops, and the equipment of electric motors for shops, and numerous other places where such motors are finding application to railway work.

At the recent meeting in Atlantic City car lighting and shop motors were the principal subjects under discussion, and while formal papers are not presented, our report of the proceedings will indicate that railway mechanical officers will find in the printed proceedings of the October meeting the latest news and descriptions of the most improved equipment for the application of electricity to railways. The society may well be regarded as a part of the larger railway mechanical associations, for its electrical standards are almost universally adopted by them, and it is fortunate that there is at hand a body of technical specialists to which such questions may be referred.

Announcements.

PROGRAM OF THE WEEK.

MASTER MECHANICS CONVENTION.

MONDAY, JUNE 17.

Prayer	9.30 A. M. to 9.35 A. M.
Address by the President	9.35 A. M. to 9.50 A. M.
Intermission	9.50 A. M. to 9.55 A. M.
Reading of the minutes of the last meeting	9.55 A. M. to 10.00 A. M.
Report of the secretary and treasurer	10.00 A. M. to 10.15 A. M.
Assessment and announcement of dues; appointment of committtees on correspondence, resolutions, nominations, obituaries, etc.	10.15 A. M. to 10.25 A. M.
Election of auditing committee	10.25 A. M. to 10.30 A. M.
Unfinished business	10.30 A. M. to 10.35 A. M
New business	10.35 A. M. to 10.45 A. M.
Discussion of reports on:	
Advisory, Technical	10.45 A. M. to 11.00 A. M.
Mechanical Stokers	11.00 A. M. to 11.30 A. M.
Revision of Standards	11.30 A. M. to 12.00 A. M.
Specifications for Cast Steel Locomotive Frames	12.00 P. M. to 1.30 P. M.

TUESDAY, JUNE 18.

Discussion of reports on:	
Main and Side Rods	9.30 A. M. to 10.00 A. M.
Consolidation	10.00 A. M. to 10.15 A. M.
Safety Valves	10.15 A. M. to 10.45 A. M.
Safety Appliances	10.45 A. M. to 11.00 A. M.
Design, Construction and Maintenance of Locomotive Boilers	11.00 A. M. to 12.00 A. M.
Contour of Tires	12.00 P. M. to 12.30 P. M.
Individual Paper on Increased Power obtained with Superheat as Compared with the Maximum Power Obtained with Saturated Steam, Prof. C. H. Benjamin and Prof. L. E. Endsley	12.30 P. M. to 1.00 P. M.
Steel Tires	1.00 P. M. to 1.30 P. M.

WEDNESDAY, JUNE 19.

Discussion of Reports on:	
Flange Lubrication	9.30 A. M. to 10.30 A. M.
Minimum Requirements for Headlights	10.30 A. M. to 11.00 A. M.
Standardization of Tinware	11.00 A. M. to 11.15 A. M.
Maintenance of Superheater Locomotives	11.15 A. M. to 12.00 A. M.
Engine Tender Wheels	12.00 P. M. to 12.30 P. M.
Resolutions, Correspondence, etc.	12.30 P. M. to 12.40 P. M.
Unfinished business	12.40 P. M. to 12.45 P. M.
Election of officers	
Closing exercises	12.45 P. M. to 1.30 P. M.

Adjournment.

ENTERTAINMENT.

MONDAY, JUNE 17.

Orchestra Concert, 10.30 A. M.—Entrance Hall, Million Dollar Pier.

Orchestra Concert, 3.30 P. M.—Entrance Hall, Million Dollar Pier.

Social Gathering and Informal Dance, 9.00 P. M.—Blenheim Exchange, Marlborough-Blenheim Hotel.

TUESDAY, JUNE 18.

Orchestra Concert, 10.30 A. M.—Entrance Hall, Million Dollar Pier.

Orchestra Concert, 3.30 P. M.—Entrance Hall, Million Dollar Pier.

Informal Dance, 9.30 P. M.—Entrance Hall, Million Dollar Pier.

MEETING OF B. & O. MEN.

It has been suggested by a number of members or guests of M. M. & M. C. B. Associations at the conventions who either served an apprenticeship, began their railway careers or have been long identified with the Baltimore & Ohio, and particularly with its mechanical department, that some kind of organization or fraternity be formed, and that they meet to-day. The American Car & Foundry Company offers its space—No. 610—as convenient, and asks all who are interested to register there Monday as early as possible.

The following are known to be here, practically all of whom have been seen and will gladly co-operate: P. C. Cromwell, J. Snowden Bell, Harry Monkhouse, C. F. Giles, T. G. Smallwood, John Tonge, B. M. Carr, J. B. Kilpatrick, R. F. Kilpatrick, J. F. Deems, F. C. Cooper, E. W. Greives, Edw. Weisgerber, W. M. Bosworth, W. F. Bentley, B. H. Hawkins, A. W. Horton, A. P. Pendergrast, J. P. Callahan, S. M. Dolan.

FOUND.

Return portion of a Pennsylvania R. R. round-trip ticket from Chicago to Atlantic City. Owner can get same by applying at the enrollment booth.

RAILWAY CLUB SECRETARIES.

The Society of Railway Club Secretaries held its annual meeting last Saturday morning at the Marlborough-Blenheim. In the absence of George H. Frazier, the chairman, who had been unexpectedly detained in Boston by business, J. B. Anderson of Pittsburgh, vice chairman, presided. The various clubs with the exception of the Richmond, St. Louis and Southern & Southwestern, were represented by their secretaries and presidents and first vice-presidents. Regrets were received from the absentees that other duties prevented their reaching Atlantic City, and made it necessary to content themselves with sending cordial greetings.

The secretary-treasurer, Harry D. Vought, in his annual report presented, said that progress has been made with the proposed organization of the American Association of Railway Secretaries, which is intended to take in as members all secretaries of railway associations except those of organized labor. As a number of these have signified their readiness to co-operate it was agreed to proceed with the movement and endeavor to complete the work during the ensuing year. Another matter of gratification was the showing as to the popularity and usefulness of the Index published by the society annually, giving the list of subjects dealt with in papers presented before all the clubs during the preceding season of activity, the names of the authors and their official connection. Mr. Vought stated that it had been highly useful for reference purposes not only by club members, each one of whom is furnished with a copy, but by others not eligible to club membership and from whom requests were received for the booklet. The effect had been to increase the circulation of the books of proceedings issued by the clubs and containing papers of special importance. During the past year nearly 10,000 copies of the Index were distributed, which is an indication of the total strength of railway club membership.

Mr. Frazier of the New England club was again re-elected chairman. Mr. Anderson of the Pittsburgh club was made vice chairman, and Mr. Vought continued in the office of secretary-treasurer, in which he has served since retiring from that of chairman some years ago. He is now the only member left of all the secretaries who were originally enrolled when the society was formed in 1896 at the sugges-

tion of Daniel M. Brady, president of the Brady Brass Company, who enjoys the distinction of being the first man that ever performed the duties of a railway club secretary.

At the Strand hotel Saturday evening the members of the society and their friends sat down to the annual dinner. W. F. Jones, of the New York Central, first vice-president of the Central club of Buffalo, presiding. Covers were laid for 30 and the occasion was one of the most enjoyable the society has had. There were no toasts and responses, as it is the rule that only two men are entitled to talk—the chairman and the club officer who occupies the head of the table.

THE PURDUE DINNER.

The Purdue men attending the conventions assembled for their annual dinner on Saturday evening. Of about fifty men in attendance at the conventions, the following were registered for the banquet: E. L. Adreon, American Brake Co.; W. L. Batt, Hess-Bright Mfg. Co.; Hugo Berthold, N. Y. C. & H. R.; Prof. L. E. Endsley, Purdue University; F. B. Ernst, American Steel Foundries; W. J. Eddy, C. R. I. & P.; R. F. Darby, The Billiod Co.; Geo. E. Hallenbeck, Baker Bros.; Percy Houser, Pennsylvania R. R.; W. S. Humes, General Railway Supply Co.; F. H. Herzsch, Westinghouse Electric & Manufacturing Co.; J. H. Jaschka, National Malleable Castings Co.; C. R. Jamison, Acme Supply Co.; J. M. Lammedee, Railway and Engineering Review; J. R. Mitchell, W. H. Miner Co.; R. R. Mitchell, Crocker-Wheeler Co.; J. P. Neff, American Arch Co.; W. H. Patterson; C. H. Quinn, Norfolk & Western; G. P. Robinson, United States assistant chief inspector locomotive boilers; F. S. Robbins, Pennsylvania R. R.; E. E. Silk, Bettendorf Axle Co.; H. A. Smith, Railway and Engineering Review; B. D. Tozzer; A. O. Van Dervort and W. H. Winterrowd, Damascus Brake Beam Co. A committee, consisting of Messrs. Endsley, Silk, Neff, Winterrowd and Lammedee, was appointed to arrange for next year's banquet.

CORNELL DINNER.

Cornellians attending the convention held their seventh annual dinner at the Hotel Chelsea on Saturday evening. This proved to be one of the most pleasant and important meetings ever held by this association. Through the courtesy of J. H. Thomas professional talent from New York furnished entertainment during the serving of the dinner and the impromptu toasts following brought out a lively discussion on subjects of serious interest to all engineering alumni of the university. B. P. Flory, superintendent of motive power of the New York, Ontario and Western was elected president for the ensuing year.

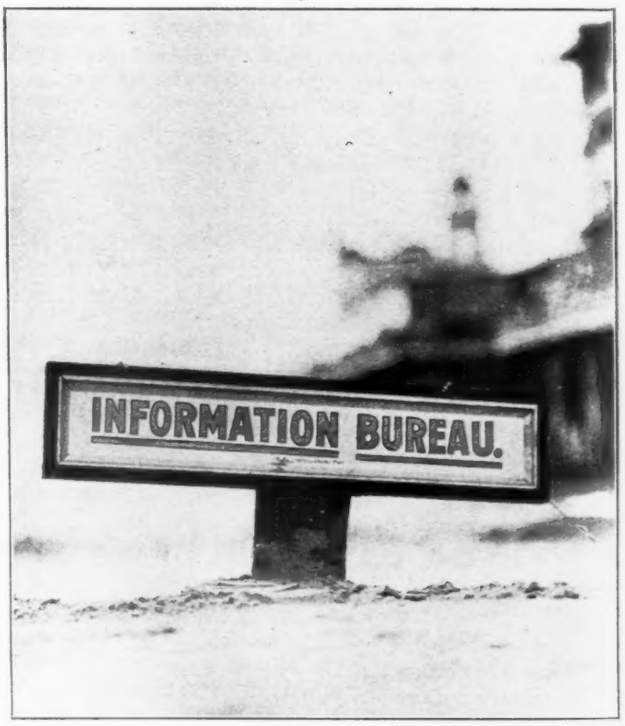
The following members and guests were present: J. F. DeVoy, '88, assistant superintendent of motive power, Chicago, Milwaukee & St. Paul; F. F. Gaines, superintendent of motive power, Central of Georgia; B. P. Flory, '95, superintendent of motive power, New York, Ontario & Western; F. M. Whyte, '89, general manager New York Air Brake Company; L. A. Shepard, '92, Scullin-Gallagher Company; C. P. Storrs, '95, Storrs Mica Company; A. R. Ayers, '00, general mechanical engineer, New York Central Lines West of Buffalo; H. G. Macdonald, '00, Standard Steel Car Company; J. N. Mowrey, '00, formerly master mechanic, New York, New Haven & Hartford; E. A. Averill, '00, Managing Editor, *American Engineer;* A. J. Sweet, '01, Nelite Works of the General Electric Company; C. D. Young, '02, engineer of tests, Pennsylvania Railroad; A. S. Lewis, '02, Chicago-Cleveland Car Roofing Company; R. L. Rogers, '03, Woven Steel Hose and Rubber Company; Mr. Sibson, '03, Harrison Safety Boiler Works; R. S. Cooper, '03, Independent Pneumatic Tool Company; F. C. Wight, '04, *Engineering News*; F. N. Bard, '04, Barco Brass & Joint Company; L. H. Snyder, '06, Jos. Dixon Crucible Company; H. H. Gilbert, '07, Pressed Steel Car Company; Sillstrom, '07, Dahlstrom Metallic Door Company; J. F. Benedict, '07, Boss Nut Company.

WHAT ARE THE WILD WAVES SAYING?

While strolling on the boardwalk,
I saw an M. C. B.
Reclining on the sand nearby
With a well-known S. M. P.

Now, what on earth can this portend?
They surely are not dolts;
One had his ear close to the ground,
The other was taking notes.

A sign near by caused me to start,
For on it plainly painted
Was "Information Bureau"—
And then I almost fainted.



What are the Wild Waves Saying?

"By crimps!" says I; I'm going to see
Who's crazy; they or I.
So down I went to find the truth,
Prepared to live or die.

"What are the wild waves saying?"
Came from the S. M. P.
"You'll find McCord in 5-1-3,"
Replied the M. C. B.

"The Pressed Steel Car is 6-2-0;
Forsyth's in 6-0-1,
And if you call at 4-2-0
You'll see a record run."

A lot more news came from the deep—
The wild waves know it all;
So if you lose your way while here,
Just drop around and call.

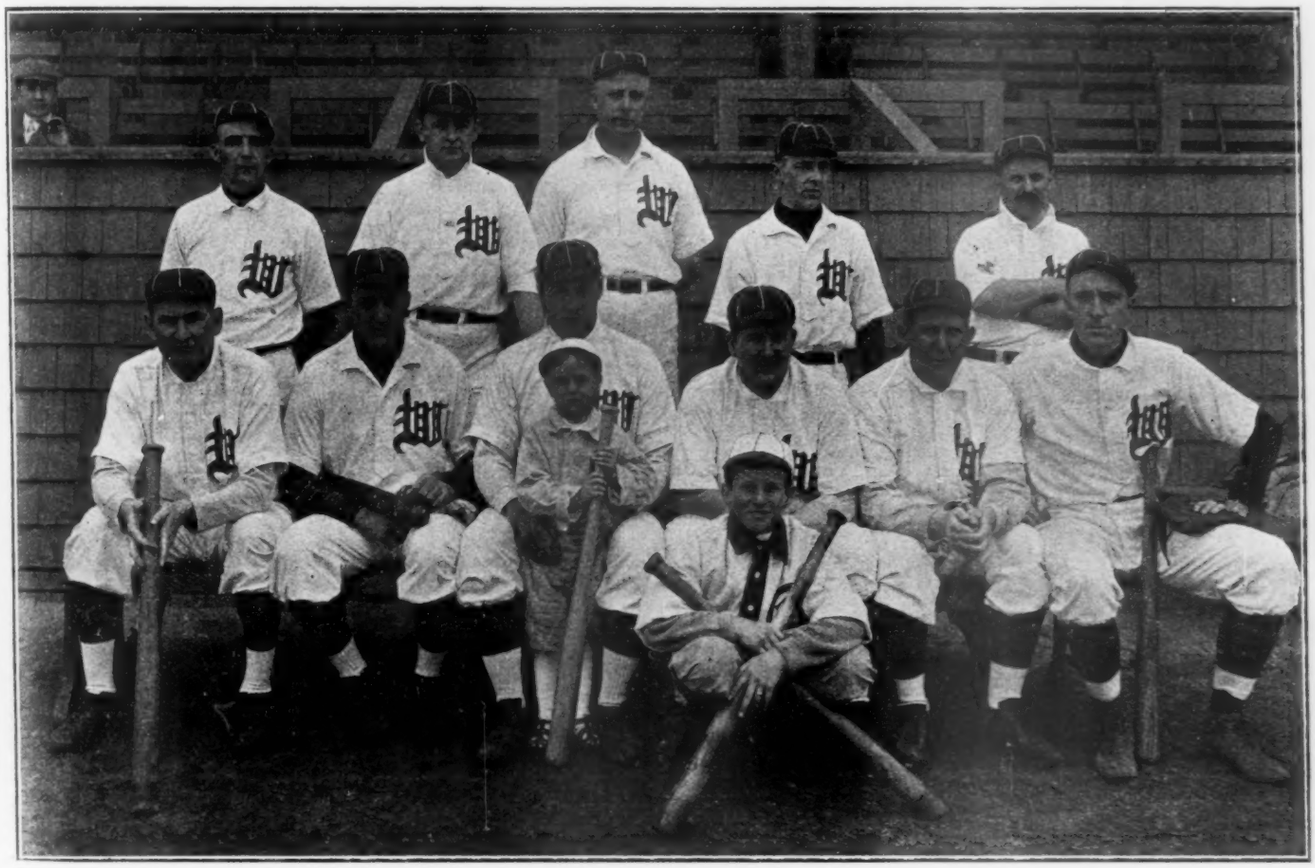
THE ANNUAL CONVENTION BASE BALL GAME.

The Western Team, by a Score of Seventeen to Ten, Wins Another Decisive Victory from the Eastern Players.

Those who expected the unexpected got what they expected at the Inlet Park base ball grounds Saturday afternoon. The expected was that the East would beat the West, and that is a perfectly good description of what did not happen. Before the gong was sounded at the end of the ninth round the effete East had once more been knocked over the ropes and was down and out. It was the eighth time that Orient and Occident had met head-on at the mechanical conventions. In four of the previous collisions the Orientals had fallen before the fierce onslaught of the Occidentals. The Easterners had come determined to even up the score. They were touted as an aggregation that could make Mathewson eat out of their hand, that could beat up the Giants as if they were pigmies, and could make the world's champion Athletics look like a Y. M. C. A. handball team. The vocal betting was three to one that they would win. But they came back all the same as Jim Jeffries. When the shades of evening fell, and the conventionites beat it to their hotels to debate whether to put on their evening clothes or not, the score of the game was Occident, 17, Orient, 10, and the score for all the games played between these rivals was East, 3; West, 5. The East came thirsting for revenge, and it went away with some more thirst. There'll be a bloody struggle next year to even up that record, you bet.

It rained, it was cold, and it looked for quite a while as if it wouldn't be possible to play, but in spite of all that it was a pretty good game. And it wasn't one-sided, either, by a long shot. At the start it looked as if it was going to be one-sided and in favor, not of the West, but of the East. Side-wheeler Bradford of the Eastern team was steady and put them over the plate whenever he wanted to, while pitcher Smith of the Western team occasionally was wild as a March hare. But in pinches Smith was reliable in both his pitching arm and his head work, and toward the last, while continuing to be fast, he become as steady as a farm horse, and while the Easterners hit him they couldn't place them, and never registered between the third and the ninth innings. Both nines gave good support, but at times it was of the back lot variety. That given by the East was better than that given by the West. The team work done by the Westerners was surprising in view of the small amount they had practised together.

The weather was distinctly rotten. When the time came for the parade to start from the Million Dollar Pier it was raining pussies and pups. The managers said, however, that there would be a game if it poured full grown tom cats and bull dogs, or Hagenbeck's whole animal show, and a considerably abbreviated procession, headed by a delegation of Atlantic City police, and including a band, teams and a bunch of waterproof rooters, started on schedule time, paddling



THE WESTERN TEAM.

Top row, left to right—McCloy, Cooke, Van Patten, Tarleton, McIntosh. Bottom row, left to right—Schwartz, Snow, Captain Hammond, Assistant Mascot Gossett, Odegaard, Mascot Telford, Smith, Midgley.

down the Boardwalk for South Carolina avenue, where special cars were in waiting. It drizzled off and on all afternoon, and was so cold that it looked as if the players would have to perform in their overcoats, and the rooters did wear theirs. But rain could not dampen nor cold cool the ardor of the players or of that faithful rooting few. They stuck right there till the dinner bell rang.

The game was mostly peaceful, but there were two controversies. In the first half of the second inning a question arose as to whether McCloy was safe at first. Captain O'Brian insisted he was out, and Captain Hammond insisted he wasn't. Umpire Cade decided he was. In the last half of the ninth the Eastern team sent Randolph and Hibbard to bat out of their order, and Captain Hammond kicked strenuously.

Honors were easy for "Midge," the veteran war-horse of the West. It was his tenth game at the conventions, and he made equally sensational two-handed not-stops. Last year Wildin's breaking of his bat was the high point of the game, and as he was called up for the first time yesterday B. A. Hageman, Jr., stepped forth and presented him with a bat big enough to be proof against the insistence of an Ajax. The only bat-breaking done yesterday was by Odegaarde, the iron man of St. Louis.

FIRST INNING.

The first batter up for the West was Tarleton, and the first ball pitched by Bradford was a strike. Tarleton was hit and walked to first, went to second on a passed ball, and stole third. Midgley struck out. Snow drove a three-bagger to center field, Tarleton scoring. Smith's slow hit towards third struck foul, rolled fair and went for a single, Snow scoring. Bradford tried to catch Smith off first and threw wild, Smith going to third. Hammond's hard drive to short was good for a single, Smith scoring. Schwartz fanned. Hammond tried to steal

THE EASTERN TEAM.

Top row, left to right—Umpire Cade, Fleming, Manager Nellis, Engle, Randolph, Hatch, Potter, Umpire Cooper. Bottom row, left to right—Bradford, Beaumont, Manager Wildin, Captain O'Brian, Mascot Mitchell, Hibbard, Oviatt, Oatley.

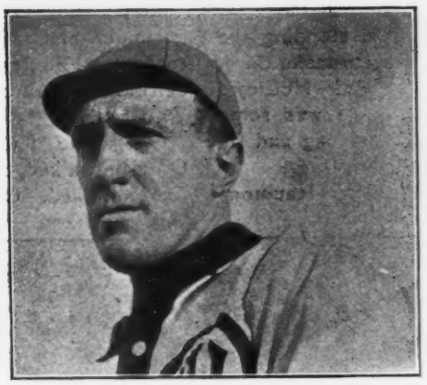
one hit, and a bunch of nice running catches, put seven men out, and assisted in putting out four others, in the course of which he participated in three double plays and covered a large acreage around second. Snow made two 2-baggers and one 3-bagger, which indicates that he was doing some tall batting. Hammond caught in good style, and made three safe hits, including a 3-bagger.

O'Brian did a good job at second, making three put-outs, one assist and one hit. Bradford struck out twelve men, which ordinarily would win a game.

George Wildin had a bet with Fred. Nellis that he would steal a base, and when he successfully slid to second in the sixth inning he grinned a grin that looked like a crisp new one-dollar bill clean across the diamond at Nellis before he got up. He made one sensational one-handed stop, and some other second while the pitcher had the ball and was put out. Three runs.

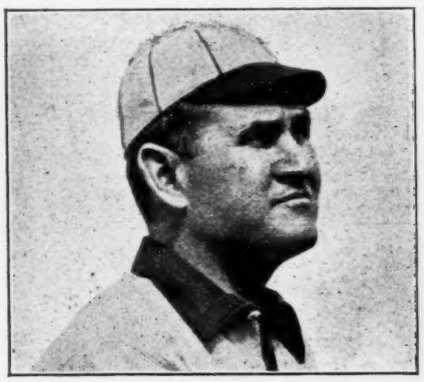
Smith couldn't find the plate, and Beaumont walked. Hammond made a nice catch of Hibbard's fly, but threw wild trying to double Beaumont at first, Beaumont going to third. Wildin beat out a slow grounder to first, but Beaumont was afraid to attempt to score. O'Brien bunted safely, Beaumont scoring, and Wildin went to second. Engle also found Smith, and made a neat two-bagger over third, Wildin and O'Brien both scoring. Engle went to third on a wild pitch and scored on Potter's slow hit to the pitcher, which he threw wild, allowing Potter to go all the way home. Fleming was hit by a pitched ball and walked to first rubbing his arm. Midgley made a nice running catch of Oviatt's hit to center and threw to first in time to make a double play. Five runs.

Harry S Hammond, c.

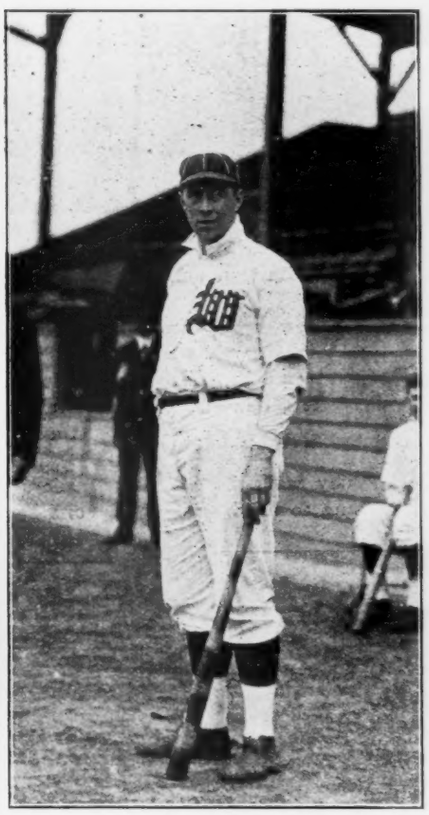


Stanley W. Midgley, 2b.

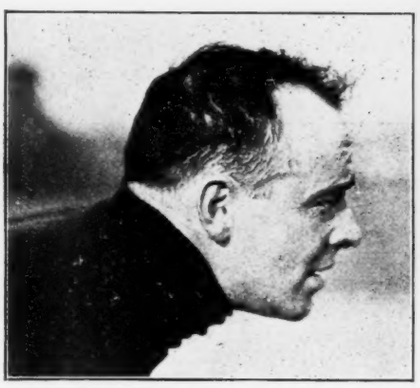
Elmer J. Smith, p.



C. L. Schwartz, 1b.



A. J. Odegaarde, 3b.



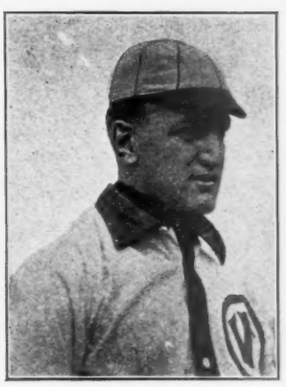
James E. Tarleton, s.s.

Capt. Harry S. Hammond, c.

J. H. McCloy, l.f.

E. B. VanPatten, Sub.

G. T. Cooke, r.f.



Neil W. Snow, c.f.

R. L. McIntosh, Sub.

THE WESTERN TEAM.

SECOND INNING.

Cooke singled through the pitcher, Hibbard stopping the ball and making a wild throw, allowing Cooke to make third. Odegaarde struck out, and Hibbard fumbled McCloy's grounder, allowing Odegaarde to score. There was some misunderstanding about McCloy's touching the bag and he was called out. Tarleton struck out. One run.

Bradford drove a single over second base. Beaumont tried to sacrifice and bunted to the pitcher, who threw wild to second. Both were safe. Hibbard's drive to right was caught by Cooke. Midgley took care of Wildin's grounder, tagged Beaumont and threw to first in time to make a double play. No runs.

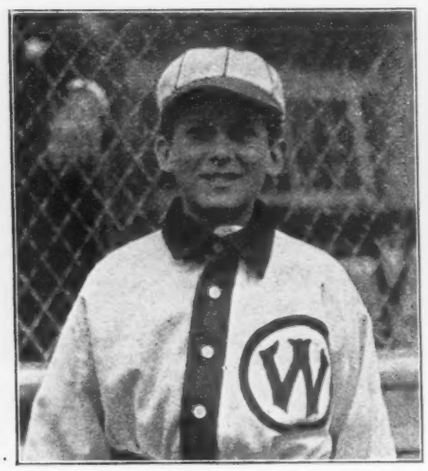
THIRD INNING.

Bradford could not find the plate, and Midgley walked. Snow made a two-bagger over third, Midgley going to third. Wildin and O'Brian took turns in juggling Smith's grounder, and at last dropped the ball, Smith getting safely to first. Midgley and Snow both scored. Hammond and Schwartz struck out. Wildin took care of Cooke's grounder. Two runs.

Odegaarde fell attempting to get O'Brian's foul fly. O'Brian walked, and went to second on Smith's wild pitch. Engle walked. O'Brian stole third, and Engle stole second. Smith stopped Potter's grounder and threw over the first baseman's head, O'Brian, Engle and Potter scoring. Fleming struck out, and Oviatt did likewise. Beaumont was hit by a pitched ball, Bradford advancing to second. Hibbard went out on a slow grounder to Smith. Three runs.

FOURTH INNING.

Wildin made a great left-handed stop of Odegaarde's hard line drive, and he was out at first. McCloy fanned. O'Brian



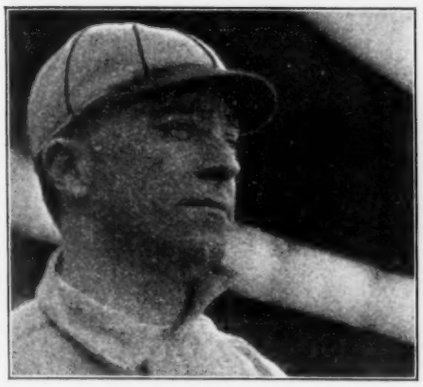
Master Elliott A. Telford, Western Mascot.

Master Edwin J. Mitchell, Eastern Mascot.

Charles Gossett, Jr., Assistant Western Mascot.

Half of Cooper and Most of Umpire Cade.

Cooper Wondering What the Captains Will Do to Cade.



Clifford Beaumont, c.f.

Harry C. Oviatt, r.f.

John V. Randolph, Sub. c.f.

J. E. Fleming, l.f.

Harry B. Bradford, p.

Leonard J. Hibbard, s.s.

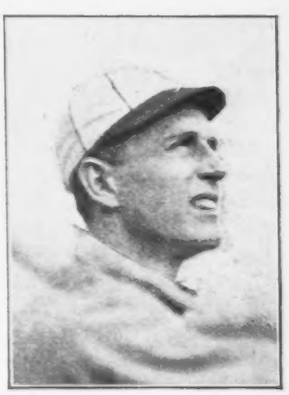
Capt. Thomas P. O'Brian, 2b.

George W. Wildin, 1b.

Al Engle, c.

H. B. Oatley, Sub. 1b.

M. C. M. Hatch, Sub r.f.



S. C. Potter, 3b

THE EASTERN TEAM.

made a nice running catch of Tarleton's fly. No runs.

McCloy robbed Wildin of a hit, getting his fly after a hard run. O'Brian was out on his grounder to Midgley. Tarleton took care of Engle's grounder and threw him out at first. No runs.

FIFTH INNING.

Engle caught Midgley's foul, and Midgley threw his bat down in disgust. Although Snow had previously made a two bagger and a three bagger, he struck out. Bradford

Some of the Waterproof Fans.

also fooled Smith, making his ninth strike out victim. No runs.

Potter placed a pretty single to left center, and stole second and third while the Western team was throwing the ball around. Fleming's fly to right field was nailed by Cooke, who made a perfect throw to the home plate, keeping Potter on third. Oviatt hit to Midgley, and Midgley threw to home to catch Potter, but again Potter decided to hug third, and Oviatt was safe on first. He immediately stole second. Bradford's line drive was caught by Smith. Beaumont walked, making the fourth time he reached first without a hit. With three on bases, Hibbard fanned thrice. No runs.

SIXTH INNING.

Hammond made a drive over first, which was good for three bases. Bradford was undecided what to do with Schwartz' slow grounder, and his throw to first was too late, Schwartz getting there safely, and Hammond scored. Potter made a nice stop of Cooke's grounder and a perfect throw to first. Wildin dropped the ball, and Cooke went to second on the error and stole third. Potter took care of Odegaarde's grounder, but his throw to first was too low for Wildin, and Odegaarde went to third, Cooke scoring during the play. Odegaarde scored on McCloy's single to right. Wildin grabbed Tarleton's grounder and touched the bag, putting him out. Midgley drove a hard single to center. Beaumont made a good throw, holding McCloy on third. Snow hit the center field fence and McCloy scored. O'Brian threw Smith out. Hammond made his third hit of the game, his second hit this inning, Snow scoring. Engle took care of Schwartz's high foul. Seven runs.

Wildin drove the first ball pitched to center for a single. Midgley caught O'Brian's fly. Wildin cleverly stole second. Odegaarde stopped Engle's grounder and touched Wildin out between second and third. McCloy made a good attempt to get Potter's long drive to left, but failed, and it went for a 2-bagger, Engle going to third. Fleming walked. Hatch now came to bat for Oviatt. He failed as a pinch hitter and struck out. No runs.

SEVENTH INNING.

Hatch began playing right field and Randolph center field for the East. Cooke was Bradford's tenth strike-out victim. O'Brian made a nice stop of Odegaarde's grounder, but could not recover himself in time to get him at first, and it went for a scratch hit. McCloy struck out, making eleven struck out by Bradford. Tarleton made a long drive to center field which Randolph caught. No runs.

Bradford went out on his hit to Smith and Randolph drew a pass. Tarleton, Midgley and Schwartz made a nice double play of Hibbard's hard grounder. No runs.

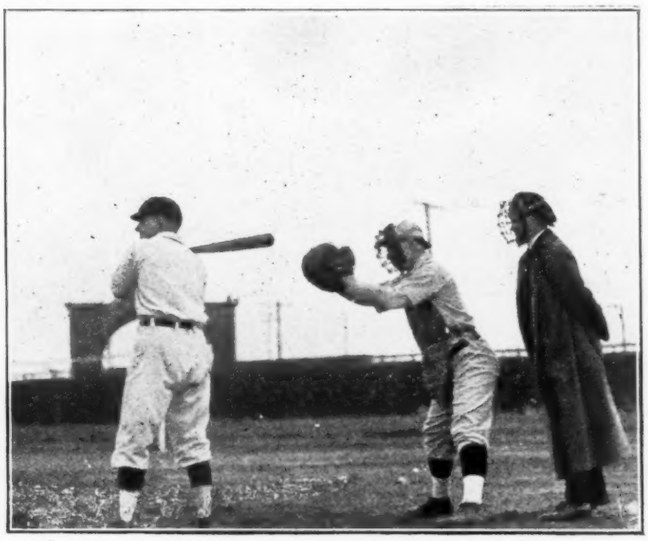
EIGHTH INNING.

Oatley began playing first for the East. Midgley drove a long fly to center which Randolph got under. Snow drove a hard grounder to Potter and was put out at first. Bradford walked. Hammond's grounder was taken care of by O'Brian. No runs.

Oatley struck out. O'Brian flied out to Midgley. Engle hit to Schwartz and was put out at first. No runs.

NINTH INNING.

Schwartz waited patiently for a base on balls, and got it. Engle failed to hold Cooke's third strike, and he went to first, Schwartz advancing to second. Odegaarde singled to right, Schwartz scoring and Cooke going to third. Cooke scored while Odegaarde was stealing second. Hibbard made a good stop of McCloy's hard grounder, but it went for a single, Hibbard's throw getting past Oatley, and Cooke, Odegaarde and McCloy scoring. Tarleton drove a single to left, and O'Brian



The First Ball Pitched.

caught Midgley's fly. Snow grounded to Bradford and was thrown out at first. Smith's long fly to left was caught by Fleming. Four runs.

Potter hit to Odegaarde, whose throw was too low for Oatley, and Potter got safely to first, and stole second. Fleming singled to first, and also stole second. Randolph flied out to Schwartz. Hibbard singled to center, Potter and Fleming scoring. Oatley struck out. The Western team claimed that Randolph and Hibbard both batted out of turn, but the referee

refused to put the side out. O'Brian was put out on a grounder to first. Two runs.

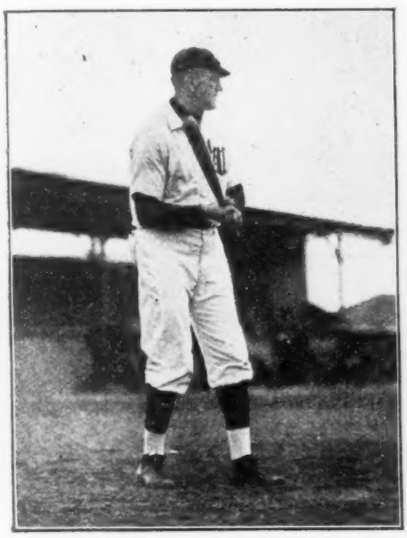
The following is the score by innings:

	1	2	3	4	5	6	7	8	9	
WEST	3	1	2	0	0	7	0	0	4	17
EAST	5	0	3	0	0	0	0	0	2	10

The following is a summary of the game:

WEST.

	A.B.	R.	1B.	S.B.	S.H.	P.O.	A.	E.
Tarleton, s.s.	5	1	1	1	0	0	2	0
Midgley, 2b	5	2	1	1	0	7	4	1
Snow, c.f.	6	3	3	0	0	0	0	0
Smith, p.	5	1	1	0	0	0	3	2
Hammond, c.	5	1	3	0	0	6	0	0
Schwartz, 1b.	3	2	0	0	0	9	0	0
Cooke, r.f.	5	3	1	2	0	2	0	0
Odegaarde, 3b.	5	2	2	0	0	2	2	0
McCloy, l.f.	5	2	2	0	0	1	0	1
Total		17	14	4	0	27	11	4



"Snow . . . . was doing some tall batting."

"Bradford tried to catch Smith off first."

"O'Brian walked."

EAST.

	A.B.	R.	1B.	S.B.	S.H.	P.O.	A.	E.
Beaumont, c.f.	1	1	0	0	1	0	0	0
Randolph, c.f.	1	0	0	0	0	2	0	0
Hibbard, s.s.	6	0	1	0	0	0	1	0
Wildin, 1b.	4	1	2	1	0	9	0	2
Oatley, 1b.	1	0	0	0	0	0	0	0
O'Brian, 2b.	5	2	1	2	0	3	1	1
Engle, c.	4	2	1	1	0	12	1	0
Potter, 3b.	5	3	2	0	0	0	2	1
Fleming, l.f.	3	1	1	1	0	1	0	0
Oviatt, r.f.	3	0	0	1	0	0	0	0
Hatch, r.f.	2	0	0	0	0	0	0	0
Bradford, p.	3	0	1	0	0	0	2	0
Total		10	9	6	1	27	7	4

Earned runs, West, 3; East, 2.
Two-base hits, Snow, 2; Engle, 1; Potter, 1.
Three-base hits, Snow, Hammond.
Bases on balls, by Smith, 7; by Bradford, 3.
Hit by pitcher, by Smith, Fleming, Beaumont; by Bradford, Tarleton.
Struck out, by Smith, 6; by Bradford, 12.
Double plays, Midgley and Schwartz, 2; Tarleton, Midgley and Schwartz.
Left on bases, West, 3; East, 12.
Wild pitches, Smith, 2.
Passed balls, Hammond.

The game was umpired by George Cooper of the Frost Railway Supply Company, and W. E. Cade of the Frank A. Barbey Company. Harry O. Fettinger (Clement Restein Company) kept the score card.

THE WESTERN TEAM.

The baseball careers of the members of the winning western team have been as follows:

Captain Hammond was both a foot ball and base ball star in his school and college days. He belongs to a family of athletes, the members of which have made names for themselves in the central-western part of the country. He naturally preferred the game of foot ball, although he edged into a base ball game whenever the opportunity offered. He was at his best in the years 1904-5-6-7 when he played right end on the University of Michigan foot ball eleven, having succeeded Neil Snow in the position.

Stanley Midgley has earned his spurs and has retired; at least he so declared after the game Saturday night. But it is to be hoped by his many friends that he will "come back" and be with us again next year. "Midge" played in his younger days in the Cook County (Illinois) league; was three years on the Lewis Institute of Technology (Chicago) team, of which he was captain; and has played the past ten years as a member of the western team at the M. C. B. and M. M. conventions, serving as captain four years.

Snow's achievements in athletics are well known. He first played ball on the Detroit high school team; then he played for one year on the Detroit Athletic Club team, and during the next four years he was a member of the University of Michigan nine, being captain two years. He always liked best the game of foot-ball, however, and in the years 1900 and 1901 he was probably the brightest star in the foot ball firmament of the West; for in the first-named year he was picked by Walter Camp for the All-American eleven, and in the following year Caspar Whitney selected Snow as his right end for the All-American eleven of the year. As a sort of side issue, just to show his general interest in athletics, as a member of the U. of M. track team, in 1903, he won the shot put and high jump events in the intercollegiate contests. Incidentally, yesterday was the anniversary of his wedding—the eighth weekly anniversary—for on Saturday, April 20, at high noon, Snow was married to a charming young lady of Detroit.

Tarleton is a pronounced "White Sox" fan in Chicago. As a youth he played second base in the Lehigh Valley (Pennsylvania) league during which time his team won the pennant twice.

Odegaarde was the best catcher and base runner the Northwest Division High School (Chicago) team ever had. Later he played on the Morris (Illinois) semi-pro. nine, then as catcher on the C. R. I. & P. Ry. team, in Chicago, and after that as a member of the Illinois Trust & Savings Bank (Chicago) team in what was known as the Mercantile League. In that year (1907) his team won the league championship. Until Saturday

he had never played third base. In Chicago, where he lives, he is a "Sox" fan.

Elmer Smith was the crack pitcher on the Central High School nine in Detroit in the years 1903-4; in the four following years he played on the then celebrated Detroit Athletic Club nine as pitcher and manager.

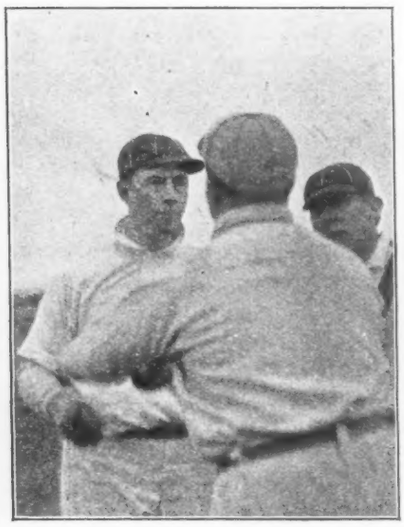
McCloy's first ball experience was with a Fairmont, West Virginia, city league team, in which he played behind the bat. He now plays in his own home-town team in Gladden, Penn., and officiates as captain and manager.

Schwartz was a semi-pro years ago at Alton, Ill., and at St. Louis, Mo. He pitched for the "Sporting News" nine in the newspaper league of St. Louis two or three years. This was his second game as a member of the Western team at the conventions.

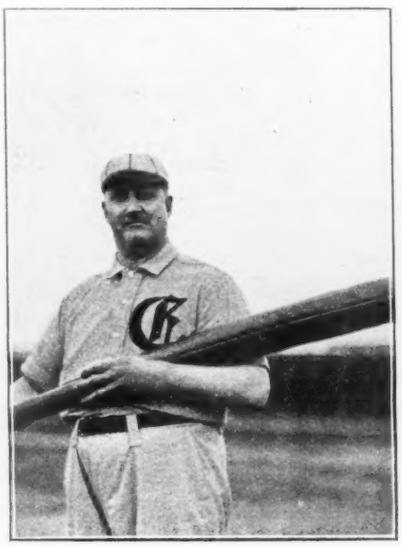
Cooke caught for the Hyde Park (Chicago) High School nine some years ago, and later he played left field and caught for the Armour Institute team in the same city in the Inter-City league. As a member of the Illinois Trust and Savings Bank team in Chicago he played in the Bankers' league in 1908-9, and in 1910 he helped win the championship for the Pullman Company's nine in what was known as the Railway League.

McIntosh, substitute, is a crack runner; he prefers the mile rather than a sprint. Base ball is a sort of side issue with him, although his friends say he would have put up a stiff game Saturday, had the opportunity offered itself. He did well in athletics at Columbia University. When he entered on his business career as a mechanical man he played base ball on machine-shop teams in different localities. Catching is his favorite position.

Van Patten, substitute, has played ball "here and there," as he expressed it and "just for fun." He likes the game more than any other form of sport and is a real fan.



"A question arose . . . ."

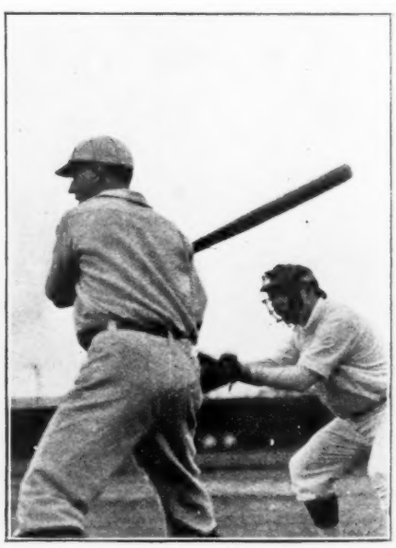


Wildin's New Bat.

" . . . and Captain Hammond kicked strenuously."

"McCloy's hard grounder went for a single."

"Potter's long drive to left . . . . went for a two-bagger."



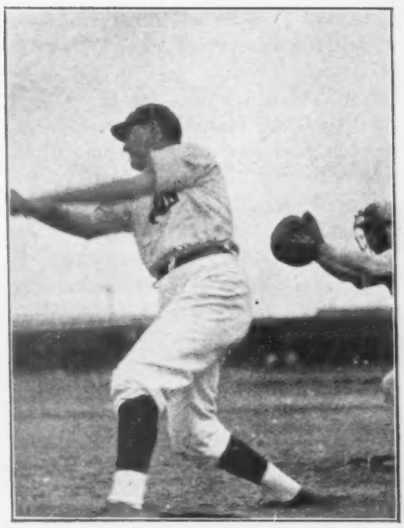
"Bradford drove a single over second."

THE EASTERN TEAM.

Thomas P. O'Brian, captain and second baseman, has had experience as a manager as well as a player. This was evident when he was on the coaching lines. For seven years he played on and managed the team of the Railway Y. M. C. A. at Buffalo. Previous to this he played second base on the Central High School team of Buffalo. He was also for

"Hammond made a drive . . . . good for three bases."

Hibbard Swinging His Bat Too Fast for the Camera but not Fast Enough to Find Smith.



"The only bat-breaking done was by Odegaarde, the Iron Man."

four years manager and second-baseman of the Pullman team of Buffalo. He is now identified with the Central Y. M. C. A. team in Brooklyn.

George W. Wildin, who played first base, used to be a pitcher of renown. At that time he weighed but 125 pounds and was on the 'Varsity team of the University of Iowa. Since then his practice has been largely with the teams at the conventions.

Harry P. Bradford, pitcher, has the distinction of having pitched a 19-inning tie game during which there were 10 hits made on his delivery and he struck out 30 men. This was when he was on the team of the Newton High School, Mass., in 1906-7. The game was between Newton and Dorchester high schools. He was pitcher for the Waltham Athletics and since then has played on teams at Wayne, Maine, and Hyannis, Mass.

Midgley's Double-Play Smile.

Clifford Beaumont, centrefielder, has confined his base ball experience largely to Baltimore and played third base on three semi-professional teams in that city, *viz.*, Westerns, Chesterfields and Strickers. When on the latter team he developed several men who have since become well known major league players.

Sheldon C. Potter, third baseman, began his serious base ball days with the team of the Cleveland University School. After entering Princeton University he made his freshman team as shortstop and for the three following years played the same position on the 'Varsity.

J. E. Fleming, leftfielder, after playing on several school teams, joined the Kewanee, Ill., team of the Central Association. He played first base with this team for five years.

A. Engle, catcher, is now playing in the same position on the team of the Central Y. M. C. A. of Brooklyn.

Beaumont Looking to See if the Umpire Saw Him Strike.

"Hatch now came to bat . . . . He failed as a pinch hitter."

Smith Almost Beaned.

Leonard J. Hibbard, short stop, played the same position on the famous Cornell University team of 1903.

Harry C. Oviatt, right fielder, played as catcher on the Mulford High School team in 1900.

Mellen C. M. Hatch, right fielder, made his base ball reputation as first and third baseman of the 'Varsity team of the University of California in 1902.

John V. Randolph, center fielder, was a member of the Boston Blues in 1890. He played first base and catcher.

Harry B. Oatley, first baseman, after playing on various school teams, entered the University of Vermont in the class of 1900. He was pitcher on the 'Varsity team in his senior year.

SOME VIEWS OF THE GAME.

P. P. Mirtz, mechanical engineer of the Lake Shore & Michigan Southern—"We are all boys when it comes to base ball. Who isn't? The annual contests between the East and West at the mechanical conventions should be encouraged by the presence of the railway and supply men, and by the ladies. Well, it was a fine game today, particularly from the pleasure viewpoint. It was well balanced and anybody's game up to the sixth inning, when the Eastern boys went to pieces. There were lots of errors, caused, I think, by too many holes in the players' gloves. There were no holes in George Wildin's gloves, but the trouble was that George didn't hold his hands where the ball was. A little high-degree superheater oil would have helped matters immensely. But George at the bat did wonderfully well, so we will forgive him."

H. A. Beaumont, B. & O.—"If they had taken my brother out of the game before it commenced, the result might have been different for the Eastern boys; perhaps they would have won. I used to play the game myself, and I would say, therefore, that as a whole, the boys did well today, considering the limited practice they must have had. The Eastern team needs a new captain; 'Smiling' O'Brian kicks too much and as for George Wildin, he is O.K. but he won't do."

W. H. Sagstetter, master mechanic, Kansas City Southern —"Sure, we enjoyed it, but it all goes to show that the Western boys are not only superior in mechanical matters as we all know, but they play better ball. The contest, best of all, showed cleanness and good fellowship, and these annual games should be encouraged."

W. M. Bosworth, mechanical engineer of the Kansas City Southern—"Wildin certainly played a 'peach' of a game; it was greatly enjoyed by the audience. Beaumont in center did good work; Bradford used his head at all times and should have had better support. O'Brien's playing was that of some ball player and if he ever comes west we would like to have him on the Western team."

W. May, master mechanic of the C. C. C. & St. L.—"It was a shame to see those eastern boys beaten; they were such nice boys. Their defeat was due to the fact that they didn't make use of the 'big stick' presented to Captain Wildin."

T. T. Cloward, P. B. T. W.—"The first part was all right and I looked for a close fight and a big score. The fielding errors and lack of team work lost the day for the Eastern boys; the lack of practice together was, of course, not their fault. I hope the game once a year will be continued."

M. M. REGISTRATION.

Allen, C. W., Shelburne.
Alling, Edw. W., M. M., N. Y., N. H. & H. R. R.
Averill, E. A., Amer. Engr., Traymore.
Barton, T. F., M. M., D., L. & W. R. R., Haddon Hall.
Bawden, Wm., M. M., Terminal R. R. Association of St. Louis, Watkins.
Bell, J. Snowden, Asst., Member, Jackson.
Bentley, H. T., P. A. S. M. P., C. & N. W. Ry., Marlborough-Blenheim.
Best, W. N., Engineer in Caloric, Shelburne.
Boughton, Wm., Locomotive Superheater Co., Marlborough-Blenheim.
Brangs, P. H., Arlington.
Brazier, F. W., S. R. S., N. Y. C. & H. R. R. R.
Brewer, J. W., M. M., B. & O. R. R., Dennis.
Brown, M. G., S. M. Power, Gulf & Ship Island R. R., Haddon Hall.
Buchanan, A. Jr., Public Service Commission, Lexington.
Burton, T. L., Westinghouse Air Brake Co., Marlborough-Blenheim.
Bussing, G. H., S. M. P. & R. S., B. & S. Ry., Haddon Hall.
Chamberlin, E., Mgr. Equipment Clearing House, N. Y. C. Lines, Marlborough-Blenheim.
Chambers, C. E., S. M. P., C. R. R. of N. J., Dennis.
Chester, W. E., St. Charles.
Clark, J. H., M. M., Staten Island Rapid Transit Ry. Co., Marlborough-Blenhem.
Cole, F. J., C. C. E, American Loco. Co., Marlborough-Blenheim.
Conniff, P., M. M., B. & O. R. R., Lexington.
Contant, M. R., M. M., Nester & Delaware, Shelburne.
Cromwell, Oliver C., M. E., B. & O. R. R., Marlborough-Blenheim.
Currie, H. A., Ass't. Elec. Eng. N. Y. C. & H. R. C., N. Y. C. R. R., Dennis.
Darlow, A. M., M. E. & Gen'l. St. Keeper, Buffalo & Susquehanna R. R., Haddon Hall.
Davis, John E., M. M., Hocking Valley R. R., Traymore.
DeVoy, J. F., A. S. M. P., Chgo., Mil. & St. Paul Ry. Co., Shelburne.
Dolan, John P., M. M., St. Louis & North Ark. R. R.,
Dolan, S. M., M. M., Marlborough-Blenheim.
Dooley, William H., M. M., C. N. O. & T. P. Ry., Dennis.
Dowd, Willard, Shop Engineer, Illinois Central, Dennis.
Dreyfus, T. F., M. M., B. & O. R. R., Traymore.
Egbers, G. F., M. M., Northern Pacific Ry. Co., Chalfonte.
Emory, John B., M. M., Texarkana & Ft. Smith Ry., States Villa.
Endsley, Prof. L. E., Purdue University, Chalfonte.
Fetner, W. H., M. M., Central of Georgia Ry., Chalfonte.
Finley, J. B., Ass't Gen. Sup., S. P. of Mex. & Sonora Ry., Chelsea.
Fitzgerald, D. E., A. S. M. P., St. Louis & San Francisco R. R, Haddon Hall.
Flory, B. P., S. M. P., N. Y., O. & W. R. R., Marlborough-Blenheim.
Fogg, J. W., M. M., B. & O., Chg. Term. Ry., Chalfonte.
Forsyth, Wm., M. E., (Asociate Member), Railway Age Gazette, Marlborough-Blenheimi.
Fowler, Geo. L., Dennis.
Gaines, F. F., S. M. P., Central of Ga. Ry., Dennis.
Garstang, Wm., S. M. P., C., C., C. & St. L. Ry.
Gentry, T. W., American Loco. Co., Wiltshire.
Glass, John C., M. M., Penna. Ry., 21 Illinois Ave.
Gould, Jos. E., S. M. P., Norfolk & Southern Ry., Dennis.
Graburn, A. L., M. E., Can. Nor. Ry., Traymore.
Graham, H. E., Supt., Pittsburgh, Allegheny & McKees Rocks R. R., Young's.
Graham, J. A., Strand.
Greenwood, H. F., Gen'l Foreman, Norfolk & Western Ry., Strand.
Haig, M. H., M. E., A. T. & S. F. Ry., Traymore.
Hale, H. H., M. M., C. H. & D. Ry., Haddon Hall.
Harris, C. M., M. M. Washington Terminal R. R., Traymore.
Hatch, M. C. M., Supt. Fuel Service, D. L. & W. R. R., Traymore.
Hawkins, B. H., D. M. M., D. L. & W. R. R., Traymore.
Henshaw, J. E., Shop Supt., St. L. & S. F. R. R., Haddon Hall.
Hyndman, F. T., Marlborough-Blenheim.
Joughins, G. R., M. S., Intercolonial Ry., Chalfonte.
Kautmann, A. G., Supt. Mach., N. C. & St. L. Ry., Runnymede.
Kellogg, D. P., Shop Supt., S. P., Haddon Hall.
Kellogg, W. L., S. M. P., C. H. & D. Ry., Haddon Hall.
Kilpatrick, J. B., Mech. Supt., C. R. I. & P. Ry., Traymore.
Kilpatrick, R. F., Elwald Iron Co., Chalfonte.
Kinney, C. D., M. M., Kanawha & Mich. Ry., Traymore.
Kinney, M. A., S. M. P., Hocking Valley Ry., Traymore.
Kirkpatrick, James, M. M., Baltimore & Ohio, Lexington.
Knight, Wm. Edward, S. M. P. & S., Cuba R. R., Traymore.
Kyle, C., M. M., Canadian Pacific Ry., Haddon Hall.
Lide, C. D., M. M., Carolina & Northwestern Ry., Aerial.
Little, J. C., M. E., Chicago & Northwestern Ry., Young's.
Lovell, Alfred, Traymore.
Machesney, A. G., Baldwin Locomotive Wo ks, Pennhurst.
Mackenzie, John, Raymond.
McRae, J. A., Chem. Engr., M. C. R. R., Chalfonte.
McGill, A. M., M. M., Lehigh Valley R. R., Traymore.

McGrath, J. T., S. M. P., Chicago & Alton Ry., Marlborough-Blenheim.
May, Walter, M. M., C. C. C. & St. L. Ry., Chalfonte.
Meade, P. J., M. M., Atlantic Coast Line R. R., Lexington.
Minshull, P. H., M. M., N. Y., O. & W. R. R. Co., Traymore
Mirtz, P. P., M. E., L. S. & M. S., Traymore.
Monhause, H., Rome Loco. & Mach. Works, Chalfonte.
Montgomery, Hugh, S. M. P., Bangor & Aroostook R. R., Dennis.
Montgomery H., M. M., Penna. R. R., Borton.
Moore, B. R., S. M. P., Duluth & Iron Range R. R., Traymore.
Morris, W. D., C. & O. R. R., Shelburne.
Mowery, J. N., M. M., N. Y. N. H. & H. R. R., Chalfonte.
New, W. E., M. M., K. C. Belt Ry., Chalfonte.
O'Neill, W. J., M. M., C. R. I. & P., Lexington.
Osborne, Harry J., M. M., C. R. I. & P., Haddon Hall.
Oviatt, H. C., Gen. Insp., N. Y. N. H. & H. R. R., Strand.
Pfahler, F. P., M. E., Wheeling & Lake Erie R. R., Wiltshire.
Phillips, C., M. M., N. O. & N. E. & A. & V. Ry., Brighton.
Platt, Jno. G., Dennis.
Powers, M. J., M. M., Denver & Rio Grande, Arlington.
Prendergast, Jas. F., M. M., B. & O. R. R., Traymore.
Quigley, Joseph, M. M., C. N. O. & T. P. Ry., Dennis.
Ramage, J. C., Supt. Tests, Southern Ry., New Berkley.
Redding, D. J., M. M., Pittsburg & Lake Erie R. R. Co., Traymore.
Reid, H. G., M. M., Can. Pac. Ry., Haddon Hall.
Reynolds, O. H., Ry. Rep., Jessup Steel Co., Pennhurst.
Rhodes, L. B., Chalfonte.
Riley, Geo. N., Supt. Motion Power, McKeesport Connecting Co., Marlborough-Blenheim.
Roope, Thos., S. M. P., C., B. & Q. Ry., Traymore.
Rossnig, W. H. P., Asst. to G. M., St. L & S F. Ry., Marlborough-Blenheim.
Sagstetter, W. H., M. M., Kansas City Southern, Shelburne.
Schwartz, C. L., A. G. M., St. Louis Refer. Car Co., Young's.
Seidel, Geo. W., Supt. Silves Shops, C. R. I. & P. Ry., Traymore.
Sharp, C. L., Gen'l. For., Rock Island Shops, Lexington.
Sheafe, J. S., Engr. Tests, Illinois Cent., Traymore.
Shepard, L. A., Atha Steel Castings Co., Brighton.
Shoemaker, H., Shop Supt., N. Y. O. & W. R. R., Traymore.
Sinclair, Angus, Haddon Hall.
Smith, R. D., S. M. P. & R. S., Boston & Albany R R., Dennis.
Smith, W. T., M. M., Chesapeake & Ohio Ry. Co., Dennis.
Sprowl, N. E., Shop Supt., Atlantic Coast Line R. R., Young's.
Stewart, A. F., M. M., Chesapeake & Ohio Ry., Traymore.
Storey, J. W., C. D., Central of Georgia Ry., Young's.
Stubbs, G. W., Repr., M. M., Gulf Line Ry., Lexington.
Sullivan, J. J., G. M. M., L. & N. Ry., Dunlop.
Sweeley, E. H., G. F. L. R., Long Island R. R., Shelburne.
Swoyer, H., Manager, American Loco. Co. Brooks Wks.
Taylor, Wm. Lucile, C. R. I. & P. R. R.
Thayer, F. C., G. R. F. E., Southern Ry., Dennis.
Thomson, S. G., S. M. P. & R. E., Philadelphia & Reading Ry., Lennox Apts.
Tinker, J. H., Div. M. M., C. & E. I. R. R., Strand.
Todd, Louis C., C. M. M., Boston & Maine R. R. Co, Young's.
Tonge, John, Chalfonte.
Turner, Amos, M. M., Lehigh Valley R. R. Co., Lexington.
Van Buskirk, H. C., S. M. P., C. & S. Rv., Chalfonte.
VanValin, H. D., Baltimore & Ohio R. R.
Wahlen, John, M. M., Montpelier & Wells River R. R., Lexington.
Walsh, J. F., G. S. M P, Chesapeake & Ohio Ry. Co., Marlborough-Blenheim.
Warnock, Harry R., G. F. L. D., Monongahela R. R., Francis.
Weisberger, E. L., M. M., Baltimore & Ohio R. R., Lexington.
Williams, E. A., Traymore.
Williams, F. H., M. M., C. R. I. & G. Rv.
Wilson, G. M., M. M., Buffalo & Susquehanna R. R.
Wright, R. V., Chalfonte.
Wyman, R. L., M. M., Lehigh & New England R. R., Pennhurst.
Young, Chas. D., A. E. M. P., Pennsylvania Lines West, Brighton.

M. M. GUESTS.

Bertin, Michel J. A., Special Apprentice, P. R. R., Altoona, Young's.
Boyer, C. W., Ass't Foreman Erecting Shop, P. R. R., Trenton N. J., Whittle.
Burkhardt, A. A., Gen'l Car For., N. Y. C. & H. R. R. Co., Pennhurst.
Burkhardt, Master James, Pennhurst.
Butterworth, J. A., Puchasing Agt's Office, Southern Ry., Traymore.
Coyle, G. W., Engineer, B. & O., Barthram.
Crawford, M. R., Gen'l Foreman, C. R. R. of N. J., Louvan.
Esterbrook, W. H., Master Painter, Public Service Rwys. Co., Bothwell.
Fisher, A. W., Signal Dept., P. R. R., Borton.
Garland, A. R., Pur. Agt. Office, P. R. R.
Gill, James J., Insp. Public Cons., Lexington.
Gsantner, O. C.
Hemming, S. V., Chemist & Eng. Tests, American Loco. Wks., Traymore.
Hinkens, E. H., Genl. Foreman, B. & O., Shelburne.
Jackson, W. S., Sec y.to S. M. P., Penna. R. R., Chafonte
Jeffrey, Thos., Genl. Piece Work Ins., D. L. & W., Shelburne.
Keller, G. W., Erecting Shop Foreman, Norfolk & Western Strand.
Lewis, A. W., Chief Material Insp., Norfolk & Western, Marlborough-Blenheim.
McCormick, C. C., Insp. Purchasing Dept., P. R. R., Dennis.
McKelven, W. D., Gen'l Foreman, P. R. R., Raymond.
McGill, A. Nelson, L. V., Traymore.
Mayer, Frank, Gen. M. B. M., Southern Ry., Pennhurst.
Merz, Chas. B., C. C. Pur. Dept., C. T. H. & S. E. Ry., Young's.
Moore, R. P., Pur. Agt., Duluth & Iron Range, Traymore.
Norton, A. W., Draughtsman, B. & O., Kenderton.
Orr, J. J., F. B. M., Lackawanna, Dennis.
Pattison, J. H., M. S. F., Norfolk & Western, Strand.
Porter, Allen, Sup., P. R. R.
Rafters, C. D., Foreman, P. R. R., Rafters.
Rhodes, Robt. S., Elec. Dept., N. Y. C., Runnymede.
Richardson, E. L., Gen. Foreman, N. & W., Strand.
Roberts, G. S., Machinist, Penna. R. R., Haddon Hall.
Robertson, A. W., Ck., Pur. Dept., D. L. & W. R. R., Netherland.
Rule, Geo., Engineer, B. & O., Barthram.
Salisbury, R. W., W. P. Insp., B. & O., Haddon Hall.
Scheifele, John, Asst. Rd. For. of Engines, P. & R. Ry., Ariel.
Schramm, T. J. Chief Clerk, G. S. M. P., D. L. & W., Shelburne.
Shaffer, C. A., Gen. Insp. of Tools, Ill. Central, Dennis.
Shay, T. M., Gen. Pass. Car Foreman, B. & O., Haddon Hall.
Shelhorn, Otto, Ord. Dept., U. S. Gov't, Lexington.
Shoester, Geo. W., For. of Electricians, P. R. R., Fontenanck.
Sisler, Lester, Chief Clerk, Interstate Com. Com., Haddon Hall.
Spratt, T., Asst. Pur. Agent, Norfolk & Western Ry., Traymore.
Stickley, T. W., Genl. Fore., Norfolk Southern, Arlington.
Town, Col. Thos. J. (Guest of J. Snowden Bell), Berkshire Inn.
Waldo, Dr. Leonard, Consulting Engineer, Shelburne.
White, H. M., Engineer, B. & O., Barthram.
White, R. H., Engr. Machinery, Amer. Loco. Works, Traymore.
Wortham, E. S., Asst. to V. P., C. & O., Chalfonte.

M. C. B. GUESTS.

Beatty, J. B., Chief Clerk Car Dept., Penna. R. R., Dunlop.
Beckam, R. F., Chief Clerk to Auditor of Disbursements, Southern, St. James.
Bower, W. C., P. A., N. Y. Central, Shelburne.
Boyce, W. D., M. E., Chalfonte.
Cloward, T. T., Gen. Foreman, Loco. Dept., Penna. R. R., Haddon Hall.
Cotton, W. A., Chief Clerk to Mech. Supt., Erie R. R., Marlborough-Blenheim.
Derbey, W. A., Eng. Tests, C. B. & O., Chalfonte.
English, G. H. B., Supervisor, P. B. & W. Ry.
French, E. L., Gang Foreman, P. R. R., Devonshire.
Furrer, O. B., Sten. to Eng. Tests, P. R. R., Traymore.
Gearhart, J. F., Master Painter, P. R. R., Dunlop.
Goodfellow, T. F., Inspec. Tests, P. R. R., Traymore.
Henry, H. B., Statistician, Union Pacific, Brighton.
Hickman, A. V., Chief Clerk A. S. M. P., Norfolk & Western, Iroquois.
Jellison, B. T., P. A., C. & O., Marlborough-Blenheim.
Kinter, J. H., Foreman Frt. Car Inspection, Penna. R. R., Edna.
Lowther, L. W., Machinist, D. L. & W. R. R., Runnymede.
Luke, W. J., Gen'l Storekeeper, Norfolk Southern, Dunlop.
Lyons, Jas., Foreman P. R. R., Chalfonte.
Mahon, W. J., St. Charles.
McCracken, J. T., Master Painter, Interboro R. T. Co., Dunlop.
Minshall, P. H., M. M., N. Y. O. & W., Traymore.
Monroe, R. C., Car Engr., N. P. & S. P., Chalfonte
Nutt, A. S., St. Louis Term. R. R., Beauvier.
O'Neill, J. F., Air Brake Instructor, Penna. R. R., Delaware City.
Partlock, W. M., Gen. Store Keeper, Seaboard Air Line, Young's.
Phipps, J. W., Air Brake Insp., B. & O., Islesworth.
Reifsteck, A. W., Secy. to G. S. M. P., J. C. R. R., Young's.
Robbins, Felix, Marlborough-Blenheim.
Rogers, C. J., Stk., D. L. & W., Bothwell.
Small, J. F., Chief Clerk P. A., Norfolk Southern, Dunlop.

Waters, John H., Ass't. M. M., Georgia R. R., Brighton.
Wertz, Cyrus, For. Painter, Reading Ry., Risley.
Wolf, John D., For. Painter, Reading, Risley.
Wood, H. G., Chief Clerk, Pur. Agt., Seaboard Air Line, Young's.
Wright, F. H., For. Elec., N. Y. Central, Marlborough-Blenheim.

J. F. WALSH TO RETIRE.

J. F. Walsh, general superintendent of motive power of the Chesapeake & Ohio, who is one of the most widely known men attending the conventions, announces that he intends to retire on July 1. He may continue to act in a consulting capacity for the C. & O., but his chief business in future will be to rest and enjoy himself.

PACIFIC TYPE LOCOMOTIVE, LOUISVILLE & NASHVILLE.

Following its usual custom of building all locomotives at its own shops, the Louisville & Nashville has just completed five passenger engines of the Pacific type at South Louisville, making thirty-eight locomotives built at this point since July 1, 1911. These engines were designed in the office of the mechanical engineer of the road and are a development of the locomotives of the same type now in service.

As will be seen by reference to the illustration, they follow modern practice in every particular. Probably the most striking feature is the very deep throat sheet which permits a liberal depth under the brick arch. This arrangement has necessitated the use of a "broken" grate that follows the lines of the mudring. Inasmuch as an arch fitting close to the flue sheet and extending well back and up in the firebox is used, the usual undesirable result of a grate of this form is overcome.

In general the boiler follows conservative practice, having 154 2¼-in. tubes, 18 ft. 6 in. in length. In addition there are 21 5½-in. flues for the superheater elements. This gives 2215 sq. ft. of heating surface in the tubes and flues. The firebox, including the arch tubes, has 229.7 sq. ft., making a total heating surface of 2444.7 sq. ft., or a ratio of 54.3 sq. ft. of heating surface to each square foot of grate area. Considering each square foot of superheater heating surface as being equivalent to 1.5 sq. ft. of evaporative heating surface the equivalent heating surface of the boiler is 2978.7 sq. ft., which gives a ratio to the 45 sq. ft. of grate area of 66.2 to 1. The superheater is of the Schmidt type.

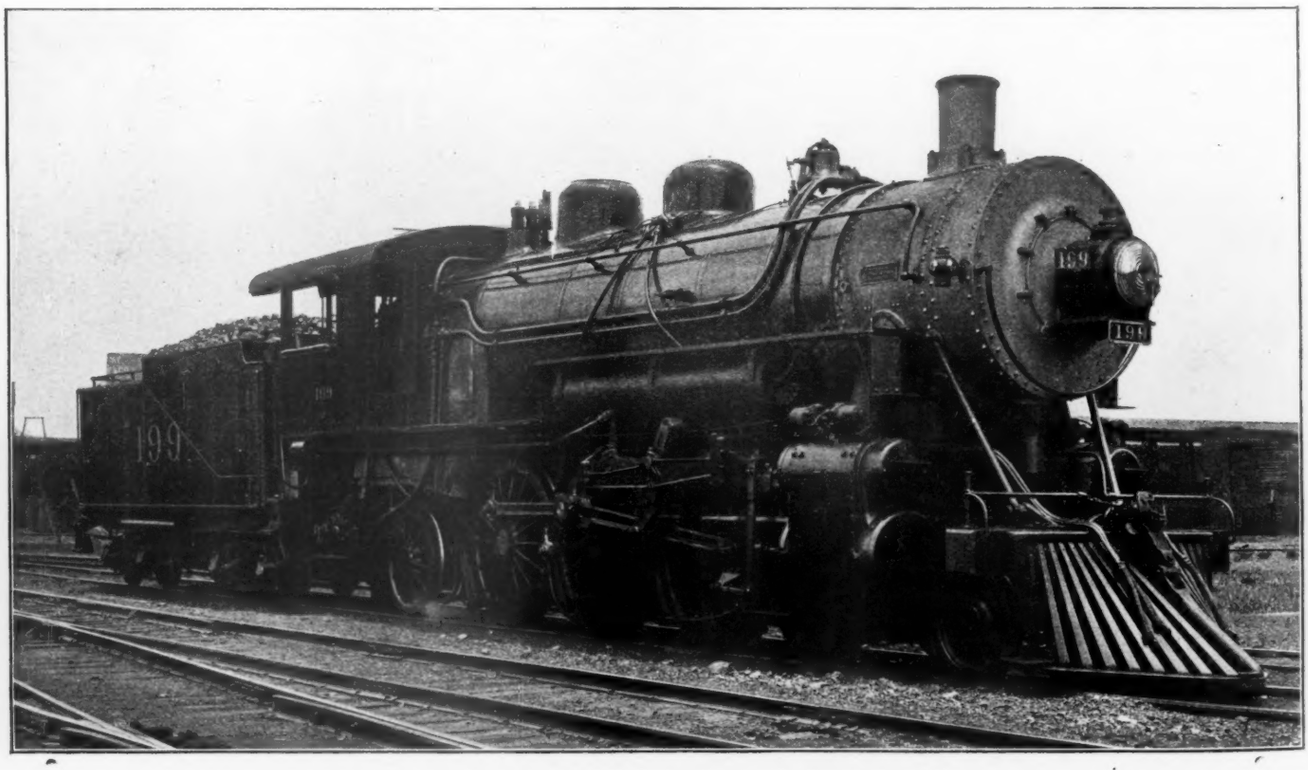
Outside steam pipes of the type now being so generally used in connection with superheater locomotives are employed in this case. The piston valves, 12 in. diameter, are operated by a design of Walschaert valve gear that has proved satisfactory on previous locomotives. The valves have 6¾-in. travel, 1⅛-in. exhaust clearance, and are set with a ¼-in. lead.

It will be noted that both injectors are on the right hand side and feed into a double check valve placed on the top center line of the boiler very near the front tube sheet. This check discharges on a baffle plate which distributes the feed water over a considerable area. Also, in this connection it will be noted that the relative arrangements of the dome, sand box and bell have been studied to give the best general appearance, and that the locomotive as a whole presents a smooth, well balanced effect. The location of the headlight at the center of the front end is in keeping with this idea. The headlight is oil burning and is provided with a fresnel lens of a design developed by the Dressell Railway Lamp Works.

The introduction of these locomotives in service has permitted the operation of 12-car passenger trains, while the previous engines, which were but 15,500 lbs. lighter, were able to handle but nine cars. They, however, were not equipped with superheaters and brick arches.

The general dimensions and weights of the new K 3 class are as follows:

Tractive effort	30,205 lbs.
Cylinders, bushed	21½ in. x 28 in.
Boiler, type	Straight top.
Boiler, minimum diameter	71 in.



Locomotive Designed and Built by the Louisville & Nashville.

Boiler, working pressure	190 lbs.
Tubes, number	21 and 154.
Tubes, diameter	5½ in. and 2¼ in.
Tubes, length	18 ft. 6 in.
Firebox, size	72¼ in and 90⅛ in.
Firebox, water space—S. and B., 3½ in.	F. 4 in.
Grate area	45 sq. ft.
Fuel	Soft coal.
Heating surface, firebox	210 sq. rt.
Heating surface, tubes, 2¼ in.	1,648 sq. ft.
Heating surface, flues, 5½ in.	567 sq. ft.
Heating surface, arch tubes	19.7 sq. ft.
Heating surface, superheater	356 sq. ft.
Driving wheels, diameter	69 in.
Driving journals	9 in. and 9½ in. x 12 in.
Engine truck wheels, diameter	33 in.
Engine truck journals	5½ in. x 11 in.
Trailer wheels, diameter	49 in.
Trailer wheels, journals	7 in. x 14 in.
Weight, on driving wheels	131,000 lbs.
Weight, engine	211,500 lbs.
Weight, engine and tender	354,900 lbs.
Wheel base, driving	12 ft.
Wheel base, total, engine	30 ft. 7 in.
Wheel base, total, engine and tender	62 ft. 9½ in.
Tender wheels, diameter	33 in.
Tender journals	5½ in. x 10 in.
Tender capacity, water	7,000 gals.
Tender capacity, coal	15 tons.

SUPERHEATED STEAM AND THE LARGE LOCOMOTIVE.

The introduction of superheated steam in railway service has made larger locomotives possible. The final capacity of a locomotive is limited by the ability of the firemen to properly supply coal to the firebox, more than by the clearance limitations of the right of way. Before the adaptation of superheated steam to the locomotive the limit in size and capacity, based on the ability of the fireman to supply the engine with fuel, had been practically reached. The use of superheated steam, however, has made it possible to extend these limits from 20 per cent. to 40 per cent.

An interesting method of illustrating the manner in which this increase has been effected is by the following example: Assume two locomotives, one using saturated steam and the other superheated steam, each burning 6000 lbs. of coal an hour. Suppose the superheated steam locomotive burns 4 lbs. of coal an hour to develop one horsepower. The locomotive equipped with a superheater furnishing highly superheated steam will develop the same power on 3 lbs. of coal, a saving of 25 per cent. The saturated locomotive will thus develop 1500 horsepower, but the superheater locomotive will develop 2000 horsepower. The difference in the power developed is 500 horsepower or a 33⅓ per cent. increase in hauling power for the same amount of fuel consumed.

From this it is readily seen that in locomotive practice the capacity increases much more rapidly than the coal saving upon which it is dependent. The work done per ton of coal is what actually counts in the reduction of the cost of transportation. It will also be noted that this increase in capacity or hauling power has been effected without any increase in actual coal consumption; that is, the fireman in handling an engine equipped with a superheater, producing steam at a temperature of from 600 to 650 deg. with the increased capacity, is doing it with no more effort than it was necessary to expend in firing the saturated steam engine.

SUPPLYMEN'S ANNUAL MEETING.

The annual meeting of the Railway Supply Manufacturers' Association was held Saturday morning in Convention Hall, with president Stafford in the chair. There was a thoroughly representative attendance when the meeting was called to order.

In his opening address, president Stafford spoke of the foresight of the association in establishing a permanent secretary's office and told how it had resulted in the accumulation of correspondence, agreements, contracts and other data that is now almost indispensable to planning and carrying out the work of the constantly changing executive administration. He next commended the efficient work of the outgoing executive and other committees, and of the vice-president and treasurer, and commented on the change of policy due to the demand of the two railway associations that certain practices heretofore recognized as standard be modified and told of the efforts made by the executive committee to conform to the wishes of the parent organizations in both letter and spirit.

Mr. Stafford gave some interesting figures covering the exhibits and membership of the association. This year the space on the Million Dollar Pier occupied by exhibitors is 83,507 sq. ft., as against 76,830 in 1911. The track exhibits compare favorably with those of a year ago. This year the membership of the association is composed of 270 exhibitors and 225 non-exhibitors, as against 245 of the former and 209 of the latter in 1911. The number of non-exhibitors this year may be increased before the end of the convention. Although more exhibit space was provided this year, something like 100 possible exhibitors could not be accommodated.

In telling about this year's exhibits, Mr. Stafford went out of his way to thank the exhibit committee for its part and to express to all exhibitors his appreciation, and the appreciation of the exhibit committee, individually and collectively, for their hearty coöperation.

The finances of the association are in a healthy condition.

Following the president's address, C. S. Storrs introduced a resolution so amending the final paragraphs of Section 7, Article I, of bylaws of the association as to make it read as follows: "After the executive committee shall have fixed this surplus amount, any money in its hands in excess of same may be returned to the members pro rata upon their payments for dues, badges and exhibit space." The resolution was adopted unanimously.

The object in adding the word " badges" to Section 7, Article I, of the bylaws, was as president Stafford pointed out in his address, to make it possible to include in the rebates to members any of the surplus derived from the sale of extra badges; and thus permit non-exhibiting members to share in that rebate.

On the subject of elections to the executive committee by voting members in the various districts, Scott Blewett spoke strongly in favor of making every effort to arouse greater interest at such elections. His remarks were approved by other speakers.

Elections of members of the executive committee, which were held Friday in the various districts, each member to serve three years, were reported as follows and duly approved: First district, Fred. M. Nellis, Westinghouse Air Brake Co., Boston, Mass.; Second district, Oscar F. Ostby, Commercial Acetylene Co., New York; Fourth district, J. C. Whitridge, Buckeye Steel Castings Co., Columbus, Ohio; Seventh district, S. M. Dolan, American Car & Foundry Co., St. Louis, Mo.

The nominating committee for officers to serve for the ensuing year reported as follows: For president, Samuel G. Allen, vice-president of the Franklin Railway Supply Company, New York; and for vice-president, B. A. Hageman, Jr., president of the U. S. Metal & Manufacturing Company, New York.

The secretary was instructed to cast the unanimous ballot of the meeting for these officers.

A rising vote of thanks was tendered President Stafford for his successful administration.

H. C. Manchester, superintendent of motive power and equipment of the Delaware, Lackawanna & Western, is attending the conventions and is accompanied by his daughter. He is looking forward to the arrival of several Pacific type locomotives that are going to make Pocono Mountain look like a mole-hill. These engines are the heaviest of this type yet built by the American Locomotive Company, with the exception of the experimental engine built for the Pennsylvania. One of them is to be equipped with a brick arch.

Conventionalities.

J. W. Faessler, of Boss expander fame, is here again this year, as is the real "Boss"—Mrs. Faessler.

E. W. Summers and Frederick Schaefer, of the Summers Steel Car Company, arrived Saturday afternoon.

G. P. Warner, general sales manager of the Pratt & Letchworth Company, has been called away unexpectedly.

James Hopkins, president of the Camel Company, arrived the latter part of last week, and is at the Marlborough-Blenheim.

P. B. Lameroux, the malleable iron man who made Beaver Dam famous, is circulating among his friends here at the convention.

They say that for the first time in the history of these conventions George N. VanSweringen's sartorial outfit has proven incomplete.

Among the familiar faces we notice Mr. and Mrs. O. M. Edwards and Mr. and Mrs. E. F. Chaffee. They are staying at the Marlborough-Blenheim.

"Doc" Bateman's face has worn the brand of smile that won't come off ever since Saturday morning, when Mrs. Bateman and the kids got here.

H. H. Schroyer, of the Acme Supply Company, and H. U. Morton, of the General Railway Supply Company, have been called to Chicago by press of business.

Roland Gerry, assistant general sales manager of the Jones & Laughlin Steel Company, is registered at the Marlborough-Blenheim and will remain until the end of the convention.

S. M. Rogers, vice-president of the Elgin, Joliet & Eastern, arrived the latter part of last week, and has been inspecting the exhibits. Mr. Rogers is at the Marlborough-Blenheim.

Mrs. A. L. Graburn, wife of the mechanical engineer of the Canadian Northern, is attending the convention this year for the first time. She and Mr. Graburn are staying at the Traymore.

Dr. W. F. M. Goss is expected to-day. Following the close of the conventions he will be at Coatesville in charge of the low water tests that are to be made there on Thursday.

S. B. Wight, general purchasing agent of the New York Central Lines, registered at the Marlborough-Blenheim Friday and proceeded to make a critical examination of the exhibits.

Robert A. Flum, of the McCord Manufacturing Company, is attending the conventions and is registered at the Brighton. He has recently changed the location of his headquarters from Detroit to Chicago.

Senator Lorimer, of Illinois, who is president of the Railway Utilities Company, arrived on Saturday, together with Mr. and Mrs. Gallagher, and will remain several days. They are stopping at the Hotel Dennis.

W. J. Eddy, formerly tool room supervisor of the Erie and now holding a similar position on the Rock Island, where he is engaged in installing a standard practice card system, is in attendance at the conventions.

The major leaguers are not the only baseball aggregations that have enthusiastic followers. Billy Dee, the animated disciple of anti-Pluvius creed has flown in from Detroit to give us an imitation of Hughey Jennings having a spasm on the side lines.

F. C. Thayer, general road foreman of engines of the Southern, is stopping at the Dennis with Mrs. Thayer. Mr. Thayer is a past president of the Traveling Engineers' Association and makes it a point to attend the Master Mechanics' Conventions each year.

M. H. Haig, mechanical engineer of the Atchison, Topeka & Santa Fe, arrived on Saturday. Mr. Haig is chairman of the committee on flange lubrication, which will make its report at Wednesday's meeting. He is stopping at the Traymore.

P. P. Mirtz, mechanical engineer of the Lake Shore & Michigan Southern, a member of both the M. C. B. and M. M. Associations, is attending the convention for the first time. He is accompanied by Mrs. Mirtz and is stopping at the Traymore.

W. E. Knight, superintendent of motive power of the Cuba Railroad, is stopping at the Traymore with Mrs. Knight and their two boys. Mr. Knight plans his vacations so as to attend these conventions. He will leave for New York to-day or to-morrow.

Robert Quayle, superintendent of motive power and machinery of the Chicago & North Western, will not attend the convention this year. So many of the mechanical department officers of that road are here that Mr. Quayle thought he had better stay at home and keep things going.

C. W. Seddon, superintendent of motive power of the Duluth, Missabe & Northern, who is attending the conventions, is delighted with the way in which his ideas of a boiler feed device were received by the members of the Master Boiler Makers' Association at the recent convention in Pittsburgh.

S. K. Dickerson, of the Lake Shore, came to Atlantic City with a brand new cane. After carrying it about for two days and getting on the verge of nervous prostation trying to keep track of it, he begged Lee Parish to take it off his hands. That explains why Lee is sporting the new stick.

In recognizing the work of Oscar F. Ostby, by making him a member of the executive committee for the next three years, the Railway Supply Manufacturers' Association has properly rewarded one who has worked hard at a most thankless task. No one covets the job of chairman of the enrollment committee.

W. F. Richards of the Gould Coupler Company is stopping at the Chalfonte with his two daughters, Misses Marie and Thelma. This is Miss Marie's third convention and Miss Thelma's first. Miss Thelma is attending a young ladies college at Buffalo; but the term fortunately ended in time for her to get to the convention this year.

F. F. Gaines, superintendent of motive power of the Central of Georgia, stands ready to talk combustion and locomotive firebox design with anyone interested in the subject. His type of firebox has been incorporated, in connection with a Security brick arch, in the boiler for the Virginian Mallets—the largest boiler ever built.

For the first time in seventeen years, George Basford will miss a convention of the Master Mechanics' Association. Pressure of business is responsible for his absence. His friends will be interested to know that he recently bought a 54 ft. cruising motor boat, bringing it from Port Clinton, Ohio, to New York over the Great Lakes, through the canal from Buffalo to Albany, and down the Hudson. The trip took about eight days.

It seems that J. H. Sanford, purchasing agent of the New Haven, declined to come to Atlantic City for fear he would be seen talking to George Wildin and thereby lose what reputation he now has. Sanford's anxiety is based on the recent arrest and conviction of Wildin for driving an automobile within the New Haven city limits with the muffler cut out. According to Sanford, Wildin was fined $15.55; and he adds that he wishes it was ten times that amount.

Among the special guests at the M. C. B. convention are the following members of the Master Car and Locomotive Painters' Association: President, J. T. McCracken, Interboro Rapid Transit; H. M. Butts, New York Central & Hudson River; George Drolette, Buffalo, Rochester & Pittsburgh; John Gearhart, Pennsylvania; D. A. Little, Pennsylvania; B. E. Miller, Delaware, Lackawanna & Western, and John D. Wright, Baltimore & Ohio. These men are very active in the Master Painters' Association and hope to attend the M. C. B. conventions every year.

The Exhibit.

The Missouri Pacific has ordered from Fairbanks, Morse & Company, Chicago, 50 of its No. 32 gasoline motor cars. This is in addition to a previous order for 40 of the same cars from the same railway.

The Anderson friction draft gear, eliminating bolts, straps and nuts, as shown on the Mid-Western Car Company's steel underframe flat car among the track exhibits, has been inspected critically by many of the railway men. The buffing arrangement is also another point of interest in the car.

Tests of the ruby mica globes made by the Storrs Mica Company, Owego, N. Y., show that they can be subjected to service on lanterns burning continuously for over 700 hours without any sign of deterioration. The company has numerous reports of lanterns fitted with mica globes being dropped from top of car without injury to globes.

The Acme Supply Company's weatherproof window and post, shown in spaces 572 and 573, indicate the best methods of combining their weatherproof window design with post construction. The post battens and envelopes are made to accommodate the window and its fixtures, so as best to accomplish the positive seal of sash by reason of assistance of the natural external air pressure. A complete model showing the wide and narrow post and standard windows is an interesting feature of the exhibit.

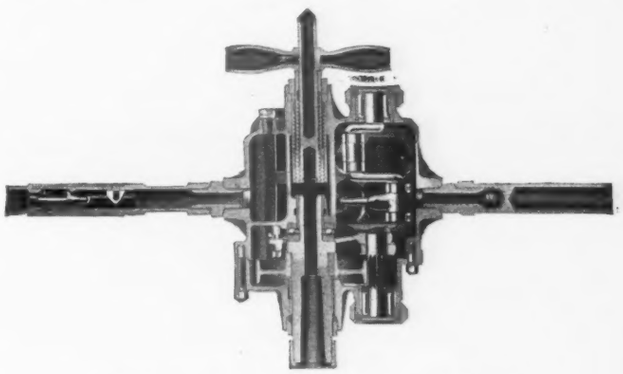
The McConway & Torley Company, Pittsburgh, Pa., is showing full size models of its different styles of passenger equipment couplers in exhibit spaces 501, 503, 505. These include the Buhoup 3-stem coupler, the Pitt passenger coupler, and the Janney passenger coupler. The 3-stem equipment is now in service on over 11,000 passenger train cars, and the Pitt passenger coupler on over 3,000 all-steel passenger cars, for which it was especially designed. Over 60 per cent. of the new passenger equipment built in the United States in 1910 and 1911 is said to have been fitted with McConway & Torley couplers.

The Pilliod Company, New York, has on hand orders sufficient to keep the plant in operation at full capacity and running 13 hours a day for about two months. The company has recently received orders for gears for 10 Atlantic type locomotives for the New York Central & Hudson River, 40 mikado locomotives for the Chicago, Rock Island & Pacinc, 25 Mallet locomotives for the Norfolk & Western, 7 Pacific type locomotives for the Western Maryland, 2 passenger locomotives for the Hocking Valley, 10 mikado locomotives for the Atlanta, Birmingham & Atlantic, one passenger and 2 consolidation locomotives for the Coal & Coke Railway and 5 locomotives for the Richmond, Fredericksburg & Potomac.

On Friday we referred to a device designed to do away with the annoyance of draft and cinders blowing in through the screens of the partially opened windows of passenger cars, shown by the Gold Car Heating & Lighting Company, New York, at its booth, 301-305. It consists of a narrow curtain wound on a vertical roller set at the side of the window and concealed in the seat back. When not wanted it is rolled back out of the way, but when in use it is drawn across the front of the window and fastened at the opposite side. It performs the same function as the deflector used for house and office windows, turning the incoming draft upwards and away from the passenger.

ROLLER BEARING AIR DRILL.

A new line of portable drilling machines has been placed on the market by the Independent Pneumatic Tool Company, Chicago. They are known as the Thor roller bearing piston air drills and possess the general features of other Thor drills of this type, such as Corliss valves, telescopic screw feed, removable crank chamber plate and a large air chamber. Although the size of the spindle has been increased the most radical improvement is in the crank shaft bearings, the connecting rods, eccentrics and eccentric straps. The crank shaft has been strengthened and runs in anti-friction roller bearings

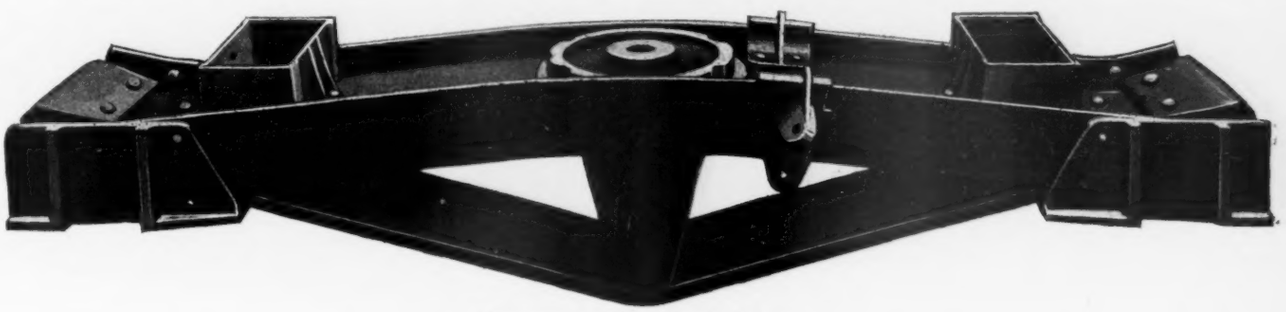


The Roller Bearing Piston Air Drill.

which are retained in a brass cage. These rollers run in bushed bearings that are hardened and ground and the end of the crank shaft is rounded so as to reduce the friction where it bears against a hardened plate thrust bearing. On account of the increased size of the crank shaft, the ordinary center bearing is dispensed with and the eccentric is made smaller in diameter and is mounted on the crank shaft. The connecting rod is made in one piece, being similar to that used in the Thor No. 8 and 9 close corner drills. Roller bearings are also provided for the idler gears in the compound drills, and an improved shifter mechanism is used on two-speed machines.

SAMPSON BOLSTER.

The Sampson bolster, made by the American Steel Foundries, Chicago, is built up, of the Simplex type, and is designed for use on trucks of heavy tenders. With modern tenders having a



Sampson Tender Truck Bolster.

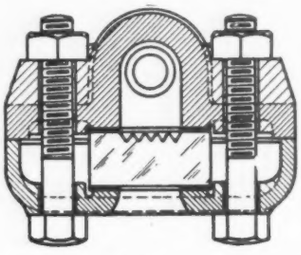
large capacity for fuel and water, the weights carried are so great as to demand a much heavier and stronger bolster than has been found necessary heretofore. This is especially so in the case of tenders for Mallet compound locomotives which frequently weigh 100 tons or more and are sometimes carried on six-wheel trucks. The Sampson bolster has been designed for service of this kind. The compression member is a 15-in. rolled steel I-beam with a rolled steel tension plate; a heavy cast steel king post is used. Bolsters of this type not only provide a structure of great strength vertically to carry the normal load but possess ample strength to resist the transverse blows and shocks due to the inertia of the trucks as well as the stresses resulting from imperfection of the truck and from heavy brake applications which are found in modern railway practice.

RAILWAY SIGNAL VOLT-AMMETER.

The General Electric volt-ammeter, type S-2, is a portable instrument of the smallest size consistent with accurate readings, for testing signal circuits in the field. The instruments are made with three volt-ammeter and three ammeter ranges, and either of the following scales may be provided: 150 v., 15 v. and 1.5 v.; 15 amperes, 1.5 amperes and 150 miliamperes; or 150 v., 30 v. and 3 v.; 15 amperes, 3 amperes and 300 miliamperes. Change is made from one range to another by simply turning a button switch on the front of the instrument and without any change of connections. Ammeter readings can be taken on any of the ranges without opening the circuit so that the clearing and hold clear current for a signal can be accurately read. The instrument, which is of pocket size, in a heavy mahogany case, is especially designed for hard usage, being an adaptation of the automobile type with very light moving element. The design is based on the D'Arsonval principle. The instruments are made by the General Electric Company, Schenectady, N. Y.

RICHARD KLINGER REFLEX WATER GAGE.

The most recent improvements in the Richard Klinger reflex water gage, type N, manufactured by the Nathan Manufacturing Company, New York, are shown in the illustration. The gage is so constructed that the pressure against the glass is distributed more uniformly and with fewer bolts than is ordinarily the case, insuring tightness under most severe requirements. The casing is simplified and is made strong and stiff to guard against warping. The cap screws ordinarily used



Section Through Klinger Water Gage.

are replaced in this latest pattern by bolts running through the casing, and still further adding to the efficiency and convenience in tightening up the bolts. The nuts rest with the flat sides against corresponding flat sides on the casing and cannot revolve, so that the tightening may be done without and difficulty whatever, by applying an ordinary monkey-wrench to the hexagon heads on the front part of the casing where they are most accessible. These gages are substituted for the ordinary tubular glass gages, and are an absolute protection to enginemen against injuries from breaking or flying glass, as the glass will not fly out of the casing even if it should break, which very rarely occurs.

COMMONWEALTH CAST STEEL ENGINE TRUCK FRAMES.

The Commonwealth cast steel frames for passenger trucks, made by the Commonwealth Steel Company, St. Louis, Mo., are well known on account of their extensive use under Pullman cars, coaches and baggage and express cars. The series of cast steel engine truck frames, here illustrated, are recent designs. In all these designs for engine trucks the pedestals

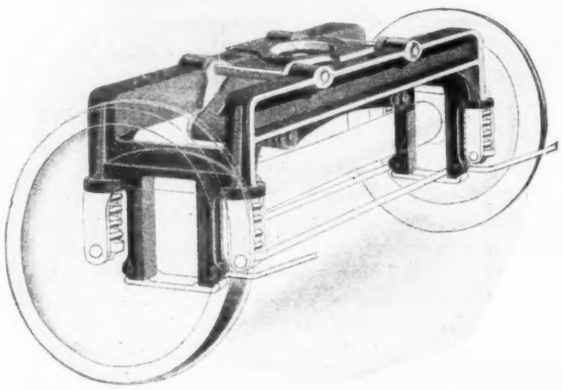


Fig. 1—Easy Riding Pony Truck.

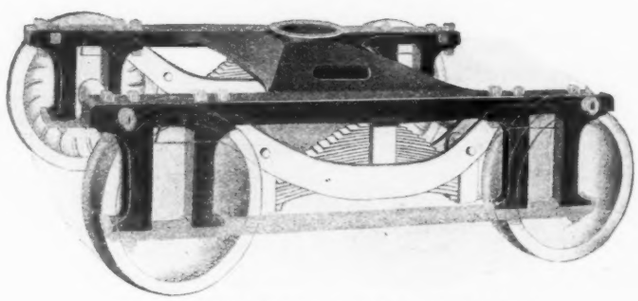


Fig. 2—Easy Riding Rigid Engine Truck.

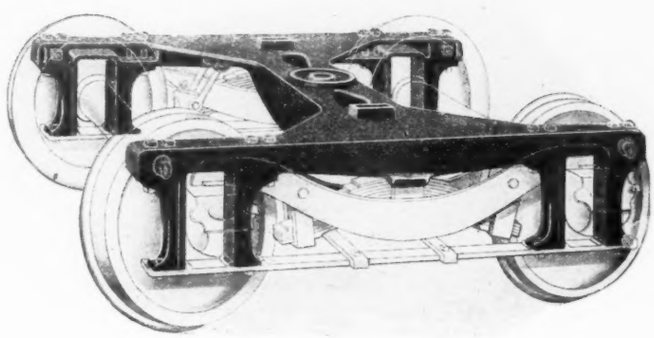


Fig. 3—Non-Derailing Tender Truck.

are cast integral with the wheel piece and transom, and this one casting makes up a large part of the structure required for a complete truck. There are very few pieces, and the number of bolts and rivets is reduced to a minimum and separate braces and gusset plates for holding the truck square are entirely eliminated. For this reason the truck is always maintained square, the cost of maintenance is greatly reduced,

and all the advantages of a square truck are constantly obtained. The flange wear is reduced by this rigid maintenance of the truck alinement. Fig. 1 shows the principle as applied to a pony truck for engines. The pedestals, spring seats and transom are cast in one piece, and in it the pivot bearings are provided for the swinging cradle which supports the center plate. In all these trucks the wearing parts are easily replaced, and they are made adjustable where necessary. Fig. 2 is a

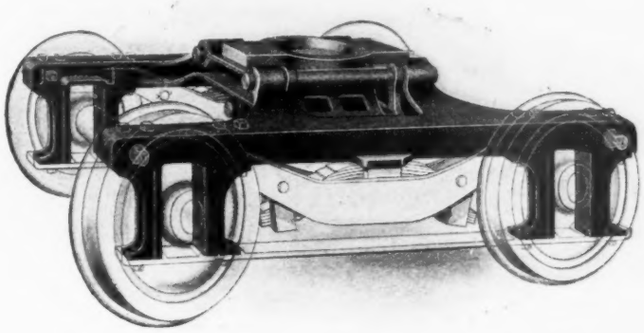
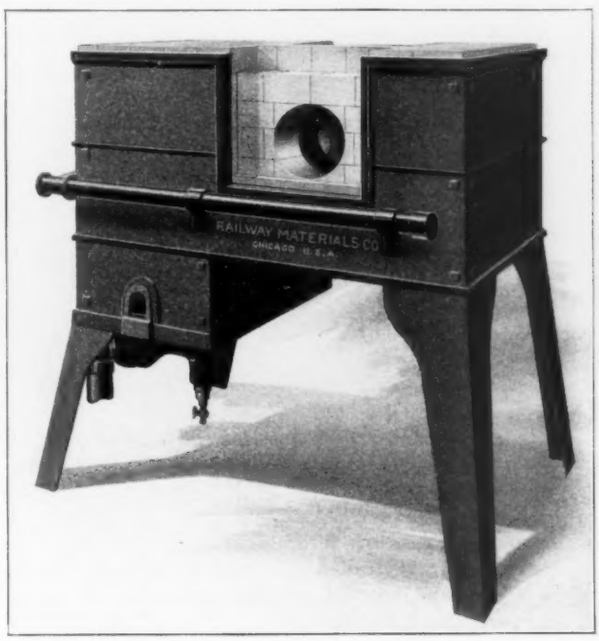


Fig. 4—Easy Riding Swing Motion Engine Truck.

four-wheel rigid engine truck, in which the pedestals, wheel piece, transom and center plate are combined in one piece. Fig. 3 is a somewhat similar design arranged for a tender truck, and Fig. 4 shows the principle as adapted to a four-wheel swing motion engine truck. Here the pivot bearings for the cradle and center plate are cast solid on the transom, as with the pony truck.

FERGUSON SUPERHEATER FLUE WELDING FURNACE.

The increased use of locomotive superheaters during the past year or two has created a considerable demand for tools for safe-ending the large tubes used in this equipment. To meet



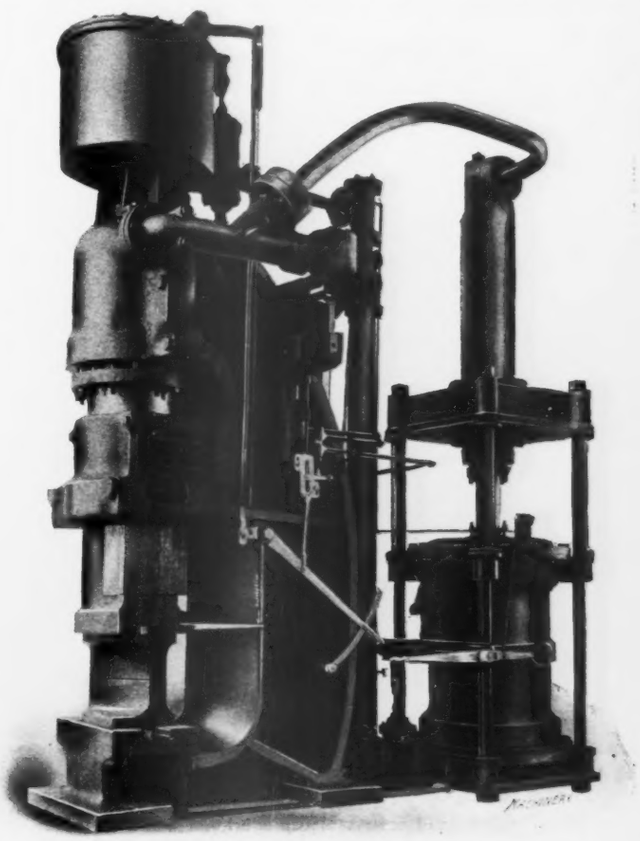
Ferguson Superheater Flue Welding Furnace.

this necessity The Railway Materials Company, Chicago, has designed and placed on the market a Ferguson furnace which is illustrated herewith. This will be recognized as a counterpart of the Ferguson furnace almost universally used in railway boiler shops for welding safe ends on locomotive flues. It is increased in size somewhat to accommodate the large superheater tubes. However, no other change has been made from the old design, and the same soft, clean, rapid and short heats are assured.

STEAM-HYDRAULIC FORGING PRESSES.

A 400-ton single column steam-hydraulic forging press made by the Chambersburg Engineering Company, Chambersburg, Pa., is shown in the accompanying illustration. The main frame is an open hearth steel casting of I-beam section, the web being heavily reinforced and stiffened by ribs. The frame has large guides for the ram and is fitted with a cap that is rigidly bolted on the front to take care of strains in any direction when forging beveled work. Additional support for the press is afforded by projecting flanges at the base of the frame.

This company manufactures the single column type in all sizes up to 400 tons pressure, and also builds a four column type with capacities up to 5000 tons. In both types a double



Chambersburg 400-Ton Steam-Hydraulic Press.

lever control is used, which is simple in construction and has the distinct advantage of being easier to operate. The operator has entire control of the press by two hand levers, one of which is used to adjust the stroke and the other to give the power stroke to the press; since their functions are the same as an operator has been accustomed to secure with the two levers of a steam hammer the operation of the press comes to him naturally. In either case the press ram follows the direction in which he has moved the hand lever.

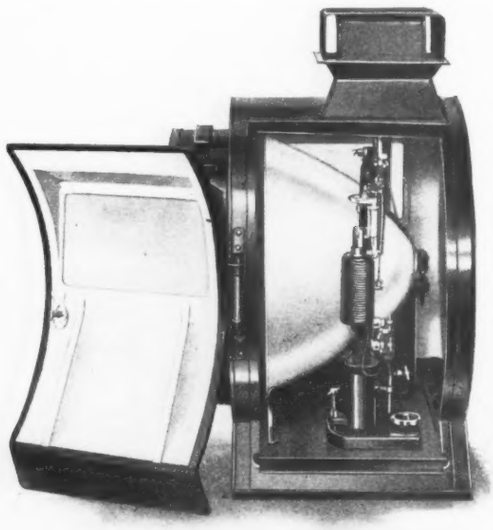
In the larger sizes of presses a triple intensifier is employed; thus in the Chambersburg press of 1500 tons capacity, by means of the triple cylinder intensifier, the operator may put either, 500 tons, 1000 tons or 1500 tons pressure on

the work and according to the work to be done use steam in proportion to the pressure exerted. This selective pressure design effects a great economy in steam consumption as compared to the usual single cylinder intensifier press in which a constant volume of steam equal to the full tonnage of the press is used regardless of the work being done. The presses are designed for maximum production at minimum operating and maintenance costs and are the result of a long experience in building hydraulic machinery.

PYLE-NATIONAL LOCOMOTIVE HEADLIGHT.

The Pyle-National turbo-electric generating set, type E, was designed by the Pyle-National Electric Headlight Company, Chicago, especially for locomotive headlight service, and has proved to be efficient, economical and reliable. It operates on all steam pressures ranging from 100 lbs. to the very highest, and on superheated as well as saturated steam without any adjustment.

Equipment E was designed to use the same armature as in previous equipments, and the same brush holders and brushes and the same ball bearings, which, as a rule, are practically all the parts that need replacing. The principal reason for designing the new type E equipment was to obtain a high steam economy, and at the same time to eliminate all features



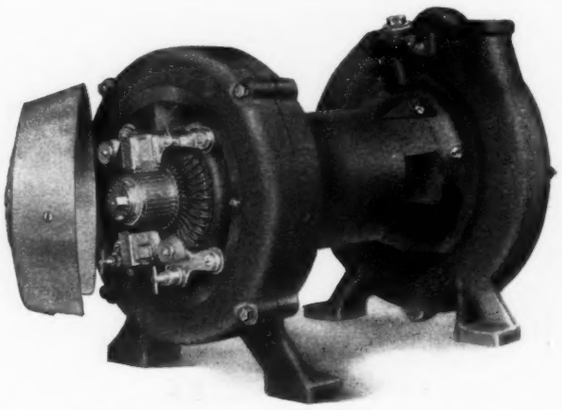
Pyle-National Electric Headlight, Type E.

of the old equipment which experience had taught were undesirable. The steam consumption is very low.

Two ball bearings of a special annular type are used on the equipment. The bearing for the generator is located in the barrel on the end of the main casting, and the bearing supporting the turbine wheel is mounted in the turbine cap. Either of the ball bearings can be removed within a few minutes' time should occasion demand.

The dynamo is of a special design for headlight service. It is of an enclosed type with all windings securely protected from the weather and mechanical injury. The windings are proportioned to carry heavy overloads without injury and cannot be burned out even when short circuited.

The case and reflector are similar in size and appearance to the regular 18-in. round headlight case now extensively used. The over-all height is 30 in. This will be especially appreciated by those who have extremely high engines. The case has a side door and numbers and a patent front goggle and inner ring which allows perfect ventilation, thereby reducing to a minimum the breaking of headlight glasses. The patent goggle is a simple design which is arranged to give free access to the reflector for cleaning, etc. The body of the case is made of heavier steel than any other case now in use. Reinforcing bands one inch wide are used throughout the case for stiffening purposes. All joints and connections are electrically welded



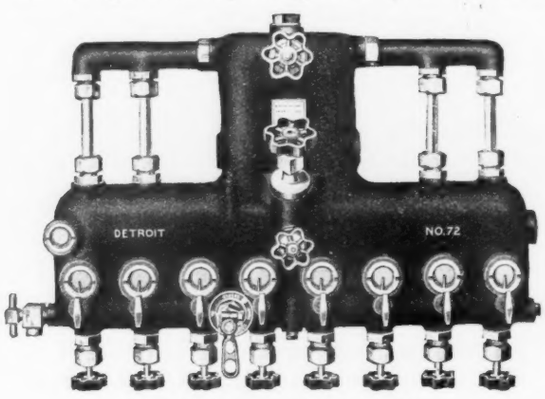
Turbine and Generator of Pyle-National Electric Headlight, Type E.

together, instead of riveted, which effectually prevents moisture or water from getting in and rusting out the metal. It is altogether the strongest headlight case that has ever been made for locomotive service.

DETROIT EIGHT-FEED LUBRICATOR.

The new No. 72 Detroit lubricator has a capacity of ten pints and eight feeds. It can be used on any locomotive on which it is desired to lubricate eight different points, particularly superheater mallet compounds. The six outer feeds can be used to lead to the high pressure valves, high pressure cylinder and low pressure valves; the two middle feeds to two air pumps, to one pump and an intercepting valve or to one pump and a mechanical stoker.

An oil control valve in the oil passage between the reservoir and the sight feed regulating valves places in the hands



Eight Feed Detroit Lubricator.

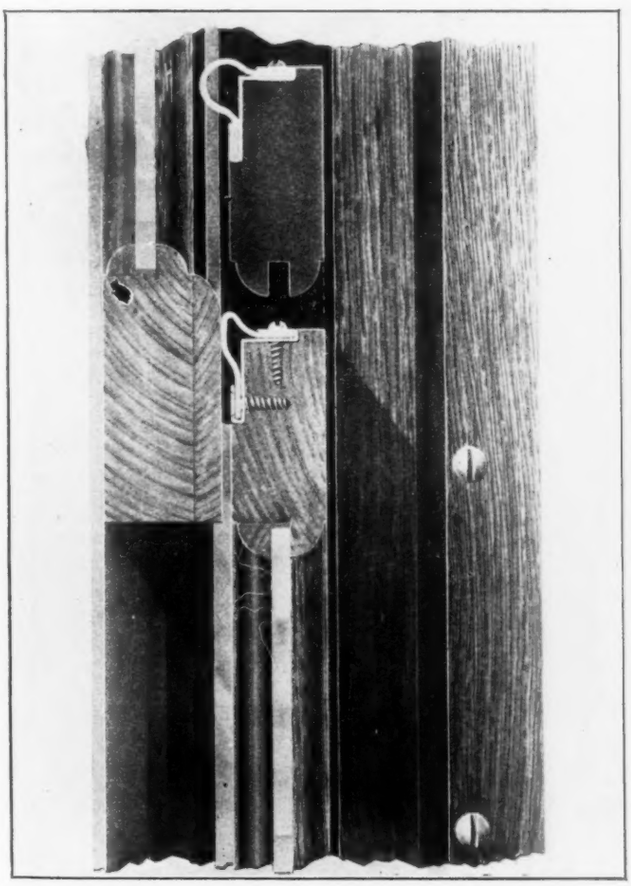
of the engineer a means of instantly starting, stopping or throttling the rate of feed and does away with the necessity of shutting off the feed regulating valves at a terminal or when refilling on the road, and consequently the necessity of again opening and adjusting all of these valves. The oil control valve makes it easy to save oil where otherwise the frequent closing, opening and readjusting of the feed valves would have made this economy impractical during short stops and periods of light service. After having once been regulated for perfect lubrication in a class of service, the feed regulating valves need not be disturbed or touched again until the service is changed.

A half turn of the oil control valve starts or stops all feeds. A quarter turn shuts off all the feeds except the two middle ones which lead to points requiring continuous lubrication. The No. 72 lubricator is cast in one piece, exclusive of trimmings, and has the equalizing tubes and the water and oil passages drilled in the walls of the body and condenser. This construction reduces the number of parts to a minimum, precludes the possibility of equalizing the oil and water tubes from jarring loose and prevents leaking. As all oil passages are in the body the oil is not exposed to the cold and the rate of feed does not fluctuate. This lubricator is made by the Detroit Lubricator Company, Detroit, Mich.

McCORD WEATHERSTRIP.

A weatherstrip for the windows of passenger cars, so arranged as to positively close the opening even under difficult conditions of alignment caused by inaccuracies of window openings or relative tortion of the car parts, is being exhibited at booth 507 by the McCord Manufacturing Company, Chicago.

The general construction and arrangement of this strip are clearly shown in the illustration, where it is shown as used as a seal between the upper and lower sash. It consists of a brass corner grasping, at the end of each leg, the edges of a strip of



McCord Weatherstrip Free and After Coming in Action.

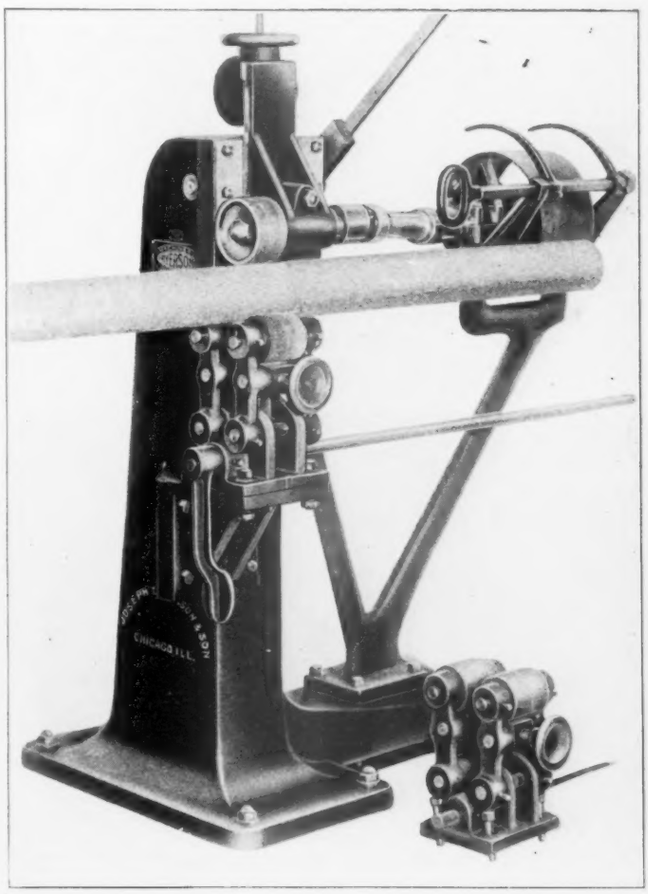
high-grade rubber, covered by linen duck. This strip will positively seal the opening up to the limit of its extension and is exceptionally durable. It will be noted that the screws holding the strip in place pass through the edges of the rubber as well as the lap on the metal body. In addition to these, however, there are spear points to retain the rubber in place while the strip is being applied.

The McCord strip has been adopted by a large number of prominent railways.

A NEW TUBE CLEANER.

The new Matthews tube cleaning attachment, which is here illustrated, was specially designed to be used in connection with the Ryerson tube cutting machine. This combination for tube cleaning and tube cutting gives the shop two complete machines for scarcely more than the price of one, and requires only the working space of one. One passage through the cleaning burrs finishes the cleaning, the tubes traveling about 10 ft. per minute. The scale is thoroughly scoured off without the slightest possibility of damage due to denting or chipping.

The essential elements are the friction wheel and the adjust-



Mathews Tube Cleaning Attachment.

able twin-roller cleaning burrs, which are built up of hardened serrated steel disks. These twin-roller cleaning burrs are assembled in a unit which is readily interchangeable with the roller tube support employed when the machine is used for cutting tubes. Hence, only two changes are required to change the cutting machine over to a cleaning machine; first, by replacing the cutting disk with the friction wheel, and, second, by substituting the tube support for the cleaning burrs. When used for cleaning the longitudinal travel of the tubes is effected by adjusting the roller support slightly out of square, the direction of travel and the rate of speed being determined by the angle of divergence. Joseph T. Ryerson & Son, Chicago, furnish these machines complete for both cutting and cleaning unless otherwise specified; but if desired, machines can be furnished equipped with cutter and reamer only.

Noiseless running is assured by the use of a universal shaft for connecting the driving shaft with the main spindle, which does away with all gearing and consequent noise. The cutting disk is 4½ in. in diameter and is secured on the main spindle which rotates in the vertical sliding head. The feed of the cutting disk is controlled by means of the counterbalanced

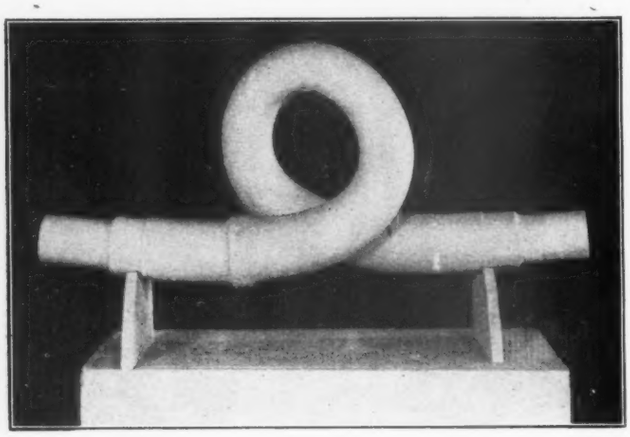
hand lever. The convenient position of the taper reamer opposite the cutting disk is an important feature of the design.

In five minutes this machine and two men can do more work and much better work than the same two men could do by hand in two hours. By the old hand method the tubes are dented, chipped and sometimes destroyed, but on this machine they are not injured in any way.

A three-fold economy is claimed for this machine: First, it reduces the cost of cleaning to about one-tenth of the hand method; second, it saves the labor cost of carrying the tubes between machines, and, third, it is the ideal tool for the moderate-sized shop, as the one machine will do all the work which at best would require two separate machines, thereby saving the expense and floor space of a second machine.

CAMBRIA STEEL AXLES.

It's easy enough to tie steel rods into double bow knots and bend car axles into fancy shapes and do it cold, if you know how—to make the steel and do the tying. At least that is what they say at the booth of the Cambria Steel Company, of Johnstown, Pa., where they have the real things which we can only show in photographs. You see, it's this way. You start away back with the ore and make the proper selections and watch it like the proverbial cat whose eye is on the mythical mouse; and you keep watching it down through the furnaces, blast and open hearth,

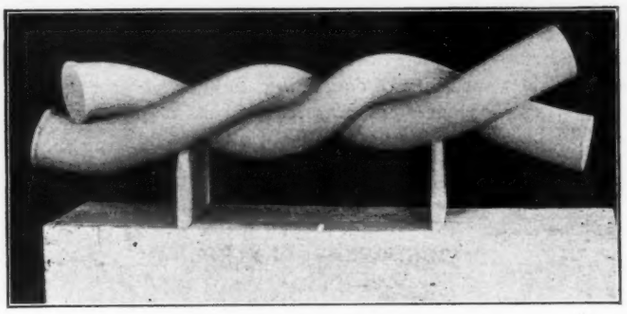


Driving Axle Bent Cold Around a Mandrel.

until it comes out into the ingot containing the proper quota of carbon, say .50 or .60, and manganese, Oh, well, anywhere along between .60 and .80, with just a dash of phosphorus, say, .02 for sauce and about .04 sulphur, as a reminder of the fires of purification through which it is passed, with silicon to suit the taste. Then, following the recommendations of Mother Goose, you

"Patty cake, patty cake, hammer man,
"And roll it and roll it,
"And pick it and pick it,
"And toss it in the oven
"For tender and car."

of course, you have to have a heavy hammer—no tack driving affair; but a real, solid, 15,000-lb. affair. And you take time for it, too, some 20 minutes or so; and when you toss it back in the oven you must regulate its heat most carefully, and when it comes out, glowing with pride, just dip it in a nice oil bath that is regulated in temperature to the nicety of a baby's morning plunge, and then wrap it up and warm again and let it sleep off its sweat in a nice Turkish bath annealing furnace until it is quite cool, and there you are. Then the piece of steel will act like a spring up to 50,000 lbs.; won't break under 90,000 lbs.; will stretch 28 per cent. before it lets go, and if you want to be real mean to it, put it under a hammer and bend it over a mandrel, or put it in a big boring mill and twist it, and you



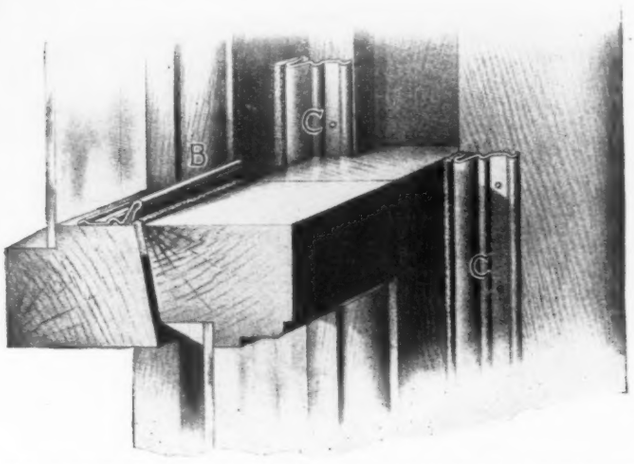
Cambria Car Axles Twisted Cold.

will find that it can be just as obstinate as you are and will elongate 45 per cent. and never show a sign of crack or flaw. Now, if that isn't an easy trick, what is?

THE ASCO WEATHERSTRIP.

The Asco weatherstrip, for use on both doors and windows of suburban cars or other passenger equipment requiring a low price seal is made of either steel or brass formed in the shapes shown in the illustration and gripping a section of finest grade felt. This felt is not affected by water or grease and has a remarkable resiliency. The same form of grip is used at all the different points on the windows, a slightly different arrangement of the same general style being provided for the door strips.

On the window sill and between the upper and lower sash, the felt strip is turned down away from the brass holder and forms the seal by its own resiliency. At the



Weather Strip for Application to Equipment Already in Service.

sides of the sash, the spring of the brass or steel shoulder is taken advantage of. This seal when properly applied insures the window or door being proof against wind, rain or dust. It is very easily applied, the holes being punched at proper intervals during the process of manufacture. It can be applied to the outside of the window as well as to the inside if desired.

The Asco weatherstrip is made by the Acme Supply Company, Chicago, and is on exhibition at booth No. 573. It is not intended for use in new high-class equipment. An inspection of this exhibit will show the construction recommended by this company for this purpose.

Railway Age Gazette

DAILY EDITION

Copyright, 1912, by the Simmons-Boardman Publishing Co.

Vol. 52. NEW YORK—JUNE 18, 1912—ATLANTIC CITY. No. 24d.

PUBLISHED EVERY FRIDAY AND DAILY EIGHT TIMES IN JUNE. BY SIMMONS-BOARDMAN PUBLISHING CO., 83 FULTON ST., NEW YORK.

CHICAGO: 417 South Dearborn St. CLEVELAND: Citizens Bldg.
LONDON: Queen Anne's Chambers, Westminster.

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Subscriptions, including 52 regular weekly issues and special daily editions published from time to time in New York, or in places other than New York, payable in advance and postage free:

United States and Mexico	$5.00
Canada	6.00
Foreign Countries (excepting daily editions)	8.00
Single Copies	15 cents each

Engineering and Maintenance of Way Edition and the four Maintenance of Way Convention Daily issues, North America, $1.00; foreign, $2.00.

Entered at the Post Office at New York, N. Y., as mail matter of the second class.

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PRESIDENT BENTLEY called attention to a subject of great importance when he mentioned the need for the enactment and enforcement of legislation to prevent trespassing on railways and the accidents that result from it. As the RAILWAY AGE GAZETTE repeatedly has pointed out the number of fatalities resulting from this cause, for which railways are not responsible at all, is greater than the number resulting from all other causes combined. On the average the number of fatalities due to trespassing is over 5,000 a year. Unfortunately, the figures relating to them are included in the regular statistics of accidents, thereby giving the general public a wholly false impression regarding the hazards of railway employment and travel. The American Railway Association at its last meeting adopted a resolution calling attention to the injustice thus done the roads, and urging both federal and state action which will reduce trespassing, and which, so long as it continues, will cause the statistics on the subject to be presented in their proper light. It is a good thing to have attention directed to the subject here, also, and everywhere else where reference to it may tend to develop sentiment and influence developments that will tend to better the situation.

WITH modern locomotives, the railways that have excellent general repair facilities and poor terminal repair equipment are very seriously handicapped. While it is advisable, from every standpoint, to keep locomotives in the shop as short a time as possible and to turn out a perfectly operating machine, it is of far greater importance to keep them out of the shop and in condition to handle full tonnage for longer periods. The roads having good engine houses and terminal shops is the one that will show a low maintenance cost on a ton-mile basis.

THE report on safety valves was not long, but it brought out a good deal of discussion, more than any other report at yesterday morning's session. The discussion showed that the calibration of safety valves is no easy matter. Indeed, it is doubtful if any stamping or marking that may be put on the valve—and this is what the discussion swung about, for the most part—can be more than an approximate indication of what occurs. It is so hard to measure the lift that one experimenter has declared it to be impossible; and as for discharge capacity, Napier's rule may be all very well in its way, but the rate of flow of steam through the annular opening varies so in the size and form of the opening, as well as the shape of the passages, that discharge calculations would be only another approximation. Of course, this is disregarding such other important items as pressure and moisture content in the steam. With all these things considered, the course pursued, of accepting the report and asking the manufacturers' to indicate the lift and estimated discharge for a guide in the use of the valve, was doubtless the wisest. As for the use of three safety valves, the discussion brought out another phase of that ever recurrent question of what will the courts say. It being generally accepted that two safety valves are quite enough to care for any generation of steam in either coal or oil burning locomotives, the third valve is put on and advocated merely because of the extra insurance and a demonstration that everything has been done to avoid diseaster. In other words, it seems to be a recognition of and compliance with unreasonable demands.

THE suggestion made by President Bentley in his address, to the effect that the Master Mechanics' Association should co-operate with the minor railway mechanical associations, is a good one. The International Railway General Foremen's Association, for instance, is in a position to study thoroughly problems pertaining to shop organization and practices and to make recommendations as to the best methods to be followed under different conditions. It could do the same thing with the special problems in connection with shop operation and equipment. The Master Mechanics' Association must concern itself with the more general problems and cannot find the time to go thoroughly into these special, but none the less important, ones. On the other hand, the minor associations are specially fitted to take them up and would undoubtedly be only too glad to co-operate with the larger organization in investigating them. The Air Brake, Master Boiler Makers', General Foremen's, Tool Foremen's, Master Blacksmiths', Traveling Engineers' and Master Painters' associations have all shown that they mean business and have been growing steadily in strength

and efficiency. The formal recognition of the worth of these associations by the M. M. and M. C. B. associations, in the way of asking them to make certain detail investigations and recommendations thereon, would still further encourage them and add to their effectiveness. Moreover, it would make the two larger organizations the clearing house for all mechanical department matters. In times past a great deal of energy has been wasted by the smaller organizations in the consideration of subjects which had already been thoroughly gone into by other organizations, or in which they were not vitally interested. There is not so much of this at present, but a closer understanding between the organizations would prevent useless duplication of work.

THERE is so much of importance and interest in President Bentley's address that it is difficult to select any particular feature as being the keynote. The general theme seemed to be that there are many features of design and operation, each equally important, all of which should be given close attention. He also drew attention to the various more prominent features that have marked the progress of the last year. Safety was given the attention it deserves in the address, as was also fuel economy. The Chicago & North Western was among the pioneers in the movement toward greater safety to employees, and the figures quoted were striking evidence of what can and should be accomplished in this direction. Not alone should attention be directed toward safety to employees, but the railways should be protected against trespassers and a federal law against trespassing on railway property was suggested as a necessary part of the work. The appointment of a committee to confer with the Chief Boiler Inspector at Washington, D. C., and straighten out the confusion resulting from the conflicting rulings of the various local boiler inspectors, was advocated. Laws on headlights passed by the various states are proving to be not only a handicap but a menace in some cases. Mr. Bentley recommended that the proper minimum requirements suitable for a double or four-track road be determined and placed on the statute books of the various states, having laws on the subject, in place of those now in force. Special requirements could then be made for the single track lines where more powerful lights can be safely used, if it seemed desirable. The multiple track lines should not be required, Mr. Bentley said, to use as powerful lights as the single track roads. Attention was drawn to the fact that locomotives of the 2-8-2 type are replacing those of the 2-8-0 type and doing more work with the same fuel consumption. Fuel economy was said to be of greater importance than ever, and the good work of the International Railway Fuel Association, of which Mr. Bentley himself was elected president at the recent meeting in Chicago, was mentioned in the address.

LOCOMOTIVE STOKERS.

EACH year the report of the committee on stokers has been more encouraging, and this year it can be termed most decidedly encouraging. It seems that at least two stokers of distinctly different types can be called successful almost without qualification. There are now, in service and being built, 115 stokers of the underfeed type and 150 of the overfeed type. These are on locomotives of several different classes used for some of the most difficult runs in the East. Throughout the whole discussion there seemed to be no question in the mind of anyone present in regard to the ability of these two stokers to do the work for which they have been designed. The very number being used is convincing evidence that those in the position to know best have decided that they are reliable.

For the first time, actual fuel saving with stokers is even hinted at in the discussions on the reports of this committee. In several cases a distinct saving was reported as following successful stoker applications. Mr. Street related one instance where a locomotive was using coal that required 18 revolutions per minute of the conveyor. Full steam pressure was being maintained and the work was successful with the exception that there was more smoke than seemed desirable. The amount of coal being used was about the same as had been required with hand firing. It was thought that if the conveyor was operated at a slower speed and less coal was consumed it might reduce the smoke. This was tried and by a series of tests it was finally found that at 12 revolutions per minute, or 50 per cent. less than at the beginning, the steam pressure was maintained equally well and the smoke was practically eliminated. No tests have been reported bearing directly on this feature, but there is quite evidently an idea among those who have had the most experience with stokers that less coal is going to be required for the same work after the engine crews become more thoroughly acquainted with the stoker. At the beginning the fireman seems to be very doubtful of the actions of the steam gage unless he sees about the usual amount of coal going into the firebox. The tendency at the start is always to overload the fire with coal.

What is the limit of the capacity of the average fireman in pounds of coal per hour on trips covering eight to ten hours? C. D. Young states between 4,000 and 5,000. Mr. Crawford recommended about 3,500, and the statements of other members seem to indicate a general idea that it should not be over 4,000. This conveyed the impression that all locomotives in regular road service that burn over this amount should be equipped with stokers. Later Mr. Crawford made clear that this was not exactly his idea. The automatic stoker is a necessity for very large locomotives, and in the coming year its various advantages will be developed by its use in such service and by application to smaller power. At present there is a prevailing idea that the dividing line where it is an advantage is where the average endurance of the fireman is reached. This view regards the stoker simply as a means of increasing the capacity of the engine. It does not take account of the incidental advantages such as economy of fuel, prevention of smoke and uniformly sustained maximum boiler pressure. These apply to locomotives of ordinary dimensions and indicate that there will be no fixed rule which limits the application of the stoker to a certain rate of coal consumption.

The record of amount of coal handled by one man was reported by Mr. Young as 8,400 lbs. an hour on a three hour trip. The train in this case averaged over sixty miles per hour. On the testing plant a fireman has fired 9,700 lbs. of coal per hour.

A point of far-reaching importance was advanced by Mr. Baker and received the attention of several other speakers. This is the fact that the quality of the engineers in the near future depends very largely on the quality of the firemen now being employed. If the work of firing prohibits a man of ordinary strength and intelligence undertaking it, it will have a serious result on the standing and class of the future engineers. If the stokers will encourage intelligent men to enter the ranks of firemen that alone will justify its general adoption.

In reference to the size of locomotives to which stokers should be applied, Mr. Crawford explained his plan to apply stokers to the larger engines first and then put stokers in the lighter power, principally that used around terminals and in suburban service. This is for the purpose of reducing smoke in the urban districts, as these locomotives are not in the least difficult to hand fire.

LOCOMOTIVE MAIN AND SIDE RODS.

IN considering the report on main and side rods, which is to be presented to-day, special attention should be given to the quality of the steel for use in locomotive details of this sort. While the experience with special alloy and heat treated steels in locomotive details is limited, it is unfortunate that this is true, for their great advantage in other similar engineering details is well recognized and their use well established. Carbon steel axles, annealed and toughened by heat treatment, have been used extensively, and alloy steel, heat-treated and oil-tempered, is used for shafts and marine machinery, and fills an important place in much of the high speed electrical machinery. In such important details as the rods for high speed locomotives the steel is forged and cooled in a rough way with little or no attention to the effect of this treatment on its granular structure, its toughness and elastic limit.

The use of alloy steel for such purposes is so limited that it was the subject of special mention when employed for the frames, cylinders and machinery of a special test locomotive, No. 50,000, recently built. Rod design has not yet been developed to the extent that it is possible by the use of high strength steel, high working stress and the smaller sections which naturally follow. The further development of the subject with respect to these possibilities should be completed before the work on the design of locomotive rods can be regarded as finishd.

In the discussion of the report last year it was shown that the breakage of fluted rods was so general that a number of lines had given up the I-section and were now using a rectangular section which caused a considerable increase in the weight of the rods. On other lines the rods are made of iron and fluted. One reason assigned to the breakage of steel fluted rods was the fact that in the forging process with a steam hammer the surface of the billet is compressed and the grain is closed up while the interior portion receives little effect of the work, and its structure has a coarse open grain with low strength and ductility. Such a forging is then milled so as to remove the best part of the steel and the poorest part remains in the web of the I-section. To overcome this, forging under hydraulic press and the use of dies which would form the rough fluted portion was recommended. The representative of a locomotive works stated that it was difficult to get uniform material for steel rods, and his description of the pipes, seams and similar defects due to segregation would indicate that the ingots bought for this purpose were of much the same character as those from which rails are manufactured.

A reading of this discussion will convince anyone that the quality of the steel used for locomotive rods and the methods of forging are not what they ought to be, and that properly proportioned rods which will not break under normal service will not be obtained until there is some considerable improvement in this respect. A high factor of safety is made necessary by the low strength and irregular quality of the steel used in current practice. The working stress now recommended is less than 13,000 lbs., or about one-sixth the ultimate strength of 80,000 lbs. For the rods of high speed engines it is easily possible to obtain steel having an ultimate strength of 110,000 lbs., and an elastic limit of 75,000 to 80,000 lbs., and with such material the section could be smaller and the rods lighter. This should be the direction of progress, but the return to the use of wrought iron and rectangular sections has been quite general according to the discussion as published in the last proceedings, indicating that the distrust of steel forgings as ordinarily made places the material below wrought iron in ultimate strength. This is a condition which should not continue, and the Master Mechanics' Association should not be content with formulæ and factors in rod design, but should insist on a proper specification for rod steel and a thorough description of the correct method of forging locomotive rods so that the proper unit strength is secured in the steel when finished. This would be a natural supplement to the present report on rod design, and the present committee should be continued to complete the work.

CAST STEEL LOCOMOTIVE FRAMES.

IT is unfortunate that the report on Specifications for Cast Steel Locomotive Frames has been delayed for another year, for the locomotive works are now busy turning out large locomotives and will probably continue to have a large output during the whole of the year to come. The design and proportion of the frames for these large engines should be based on the quality of the material, and there is now a pressing demand for a proper specification for cast steel suitable for this purpose.

The relation of locomotive power to the total weight has had some consideration in designing passenger engines in order to increase the size of boiler without exceeding the proper limits of wheel loads, and there is no good reason why the same principle should not be applied to large freight engines where the boiler is so heavy that some reduction in weight of other principal parts can be made without making the total less than that required for adhesion. To obtain the necessary weight on drivers by the use of heavy frames is a crude method of design, and yet it is frequently seen in many locomotives where this extra weight would be more advantageous in the boiler. Locomotive frames are now made 6 in. and 7 in. wide, and they require wide pedestal binders and other fittings which are correspondingly heavy, and these are located where the frequent removal necessary is laborious. It is surprising too to find these heavy frames of uniform width, when the pattern could be made of various widths proportional to the loads. The drawings of cast steel locomotive frames show that the old plans which were used for wrought iron are still used, and if the proportions are changed they are enlarged, which indicates that the superior strength of the new material is not utilized.

This is probably due to the fact that for a time cast steel frames of the same dimensions as wrought iron broke with equal frequency, but these steel frames were not annealed and they failed on account of shrinkage stresses. Nevertheless, extreme caution still prevents most designers from taking advantage of the greater reliability of the annealed cast steel frames. The wrought iron frame with its numerous welds, or places where the grain of the iron was affected by the welding operation, lacked uniformity in strength, and this defect was about balanced in the cast steel frame by local stresses and poor granular structure due to lack of annealing. The majority of locomotive frames are now made of steel, and good practice requires them to be annealed. Added to this, the use of alloys in steel produces a metal of superior strength and high elastic limit. The ultimate strength of such material is over 80,000 lbs. and the elastic limit 50,000 lbs. With such material available it ought to be possible to revise the drawings, making the frames lighter, and by rational design of the sections they should be of more uniform strength.

A thorough investigation of the quality of steel for locomotive frames and proper heat treatment should result in such a modification of frame design that it would favorably affect other locomotive proportions. These advantages are in a way proportional to the weight of the locomotive, and with the enormous machines now coming into service so rapidly it will be seen that a specification for the grade of steel used in frames should be forthcoming without any delay.

Announcements.

TO-DAY'S PROGRAM.

M. M. ASSOCIATION.

Discussion of reports on:	
Main and Side Rods	9.30 to 10.00
Consolidation	10.00 to 10.15
Safety Valves	10.15 to 10.45
Safety Appliances	10.45 to 11.00
Design, Construction and Maintenance of Locomotive Boilers	11.00 to 12.00
Contour of Tires	12.00 to 12.30
Individual Paper on Increased Power obtained with Superheat as Compared with the Maximum Power obtained with Saturated Steam, Prof. C. H. Benjamin and Prof. L. E. Endsley	12.30 to 1.00
Steel Tires	1.00 to 1.30

ENTERTAINMENTS.

Orchestra Concert, 10.30 A. M.—Entrance Hall, Million Dollar Pier.

Orchestra Concert, 3.30 P. M.—Entrance Hall, Million Dollar Pier.

Informal Dance, 9.30 P. M.—Entrance Hall, Million Dollar Pier.

FOUND.

Two pairs of eyeglasses. Apply at office of John D. Conway, secretary of the Railway Supply Manufacturers' Association.

M. M. MEMBERS PLEASE REGISTER.

In the meeting yesterday Secretary Taylor asked the members of the M. M. Association to register some time during the three days of their convention. It is only by their registering a second time that the association will be able to find out who is in attendance at the M. M. convention, and if they will do so the secretary will appreciate it very much.

TRANSPORTATION FOR RETURN TRIPS.

The Pennsylvania has notified members of the M. M. Association that transportation home over the Pennsylvania lines will be provided if they will hand their names to Secretary Taylor. This transportation must be limited to bona fide railway officers and cannot include members of belt lines, car lines or switching roads operated by industrials.

The Central of New Jersey offers the same courtesy to members who wish to return over the Central of New Jersey or the Reading. A special train of parlor cars for New York will leave Atlantic City at 2.30 on Wednesday afternoon, June 19.

SPECIAL TRAIN TO COATESVILLE.

The Parkesburg Iron Company will run a special train of all stateroom cars via Pennsylvania Railroad, leaving Atlantic City at 9.03 P. M., Wednesday, June 19. After inspecting the Parkesburg skelp and tube mills, automobiles will be provided to take the passengers to see the Jacobs-Schupert low water boiler test at Coatesville, Pa.

The special will leave Parkesburg for Philadelphia at 4.30 P. M. Thursday.

All railway officers who have made preliminary arrangements and other railway men who wish to go will secure tickets Wednesday at the Parkesburg Iron Co.'s booth, No. 388, until the accommodations are exhausted.

M. M. ASSOCIATION OFFICERS, 1911-1912.

President, H. T. Bentley, P. A. S. M. P., C. & N. W.

First Vice-President, D. F. Crawford, G. S. M. P., Penna. Lines.

Second Vice-President, T. Rumney, Asst. 2nd V. P., C. R. I. & P.

Third Vice-President, D. R. MacBain, S. M. P., L. S. & M. S.

Treasurer, Angus Sinclair.

Executive Members, T. H. Curtis; G. W. Wildin, M. S., N. Y. N. H. & H.; F. F. Gaines, S. M. P., Cent. of Ga.; C. A. Seley, M. E., C. R. I. & P.; J. F. Walsh, G. S. M. P., Ches. & Ohio; E W. Pratt, A. S. M. P., C. & N. W.

Secretary, Jos. W. Taylor.

COMMITTEES M. M. ASSOCIATION.

STANDING COMMITTEES.

Advisory Technical:—G. W. Wildin (Chairman), M. S., N. Y. N. H. & H.; A. W. Gibbs, C. M. F., Penn. R. R.; W. A. Nettleton.

Revision of Standards:—T. W. Demarest (Chairman), S. M. P., Penna. Lines; J. D. Harris, Roland Park, Md.; W. E. Dunham, Supt. M. P. & M., C. & N. W. Ry., Winona, Minn.

Mechanical Stokers:—T. Rumney (Chairman), Asst. 2nd V. P., C. R. I. & P.; E. D. Nelson; C. E. Gossett, M. M., Minn. & St. Louis; J. A. Carney, S. S., C. B. & Q.; T. O. Sechrist, M. M., C. N. O. & T. P.; S. K. Dickerson, A. S. M P., L. S. & M. S.; Geo. Hodgins.

SPECIAL COMMITTEES.

Specifications for Cast-steel Locomotive Frames:—C. B. Young (Chairman), M. E., C. B. & Q.; E. W. Pratt, A. S. M. P., C. & N. W.; R. K. Reading, S. M. P., Penna. R. R.; O. C. Cromwell, M. E., B. & O.; C. E. Fuller, A. G. M., Union Pacific; L. R. Pomeroy.

Main and Side Rods:—W. F. Kiesel, Jr., A. M. E., Penna. R. R.; H. Bartlett, G. S. M. P., Boston & Maine; G. Lanza, Mass. Institute of Technology; H. B. Hunt; W. E. Dunham, Supervisor M. P. & M., C. & N. W.

Consolidation:—D. F. Crawford (Chairman), G. S. M. P., Penna. Lines West; H. V. Vaughan, Asst. to V. P., Can. Pac.; G. W. Wildin, M. S., N. Y., N. H. & H.

Safety Valves:—W J. Tollerton (Chairman), A. G. S. M. P., C. R. I. & P.; I. B. Thomas, M. M., Penna. R. R.; W. D. Robb, Supt. Grand Trunk; Prof. E. C. Schmidt, University of Illinois.

Safety Appliances:—H. T. Bentley (Chairman), P. A. S. M. P., C. & N. W.; M. K. Barnum, G. S. M. P., Ill. Cent.; C. B. Young, M. E., C. B. & Q.

Design, Construction and Inspection of Locomotive Boilers:—D. R. MacBain (Chairman), S. M. P., C. R. I. & P.; C. E. Chambers, M. M., C. R. R. of N. J.; T. W. Demarest, S. M. P., Penna. Lines; F. H. Clark, G. S. M. P., B. & O.; R. E. Smith, G. S. M. P., A. C. L.; E. W. Pratt, A. S. M. P., C. & N. W.; J. Snowden Bell.

Contour of Tires:—W. C. A. Henry (Chairman), S. M. P., Penna. Lines; J. A. Pilcher, M. E., N. & W.; O. C. Cromwell, M. E., B. & O.; H. C. Oviatt, Gen. Insp., N. Y., N. H. & H.; O. M. Foster, M. M., L. S. & M. S. Ry., Elkhart, Ind.; G. W. Seidel, S. S., C. R. I. & P. Ry., Silvis, Ill.

Steel Tires:—L. R. Johnson (Chairman), A. S. M. P., Can. Pac.; J R. Onderdonk, Engr. Tests, B. & O.; C. H. Hogan, D. S. M. P., N. Y. C. & H. R.; R. L. Ettenger, C. M. E., Southern Ry.; L. H. Turner, S. M. P., P. & L. E.

Flange Lubrication:—M. H. Haig (Chairman), M. E., A. T. & S. F.; T. W. Heintzleman, S. M. P., So. Pac.; D. J. Redding, M. M., P. & L. E.; A. Kearney, A. S. M. P., N. & W.; W. C. Hayes, S. L. O., Erie.

Minimum Requirements for Headlights:—D. F. Crawford (Chairman), G. S. M. P., Penna. Lines, West; A. R. Ayers, A. M. M., L. S. & S. M. S.; C. H. Rae, G M. M., L. & N.; J. W. Small, S. M. P., S. P. Co.; F. A. Torrey, G. S. M. P., C. B. & Q.

Standardization of Tinware:—A. J. Poole, S. M. P., S. A. L.; M. D. Franey, A. M. M., L. S. & M. S. Ry.; J. C. Mengel, M. M., Penna. R. R.

Maintenance of Superheater Locomotives:—R. D. Smith, S. M. P., B. & A.; W. H. Bradley, M. M., C. & N. W.; H. H. Vaughan, Asst. to V. P., C. P.; Jas. Chidley, M. M., L. S. & M. S.; J. B. Kilpatrick, S. M. P., C. R. I. & P.

Engine Tender Wheels:—Wm. Garstang (Chairman), S. M. P., C. C. C. & St. L.; W. C. A. Henry, S. M. P., Penna. Lines, West; A. E. Manchester, S. M. P., C. M. & St. P.; R. L. Ettenger. C. M. E., Southern Ry.; J. A. Pilcher. M. E., N. & W.; O. C. Cromwell, M. E., B. & O.

Individual Paper:—"Report of progress on the increased power obtained with superheat as compared with the maximum power obtained with saturated steam," Dean C. H. Benjamin, Prof. L. E. Endsley.

THE B. & O. CLUB.

At a meeting yesterday in the American Car & Foundry Company's booth an organization was formed which probably will be called the B. & O. Club. It is to be composed of members and guests regularly attending the conventions of the mechanical associations who are or formerly were in the employ of the Baltimore & Ohio. E. W. Grieves, who was called on to make a speech, explaining the purpose of the meeting, told a story about an engineer and a fireman who were employed on the B. & O. when camel back locomotives were prevalent on it and who met in Chicago. Each soon found out that the other was a railway employe. "What road are you working for?" asked the engineer. "The B. & O," replied the fireman. "What's your road?" "I'm on the B. & O., too—what do you do?" "I run an engine," answered the engineer. "Well, I'm firing an engine. What's your engine's number?" "No. 713." "Well, now, that's strange," said the fireman; "I've been firing that same engine for a year." Mr. Grieves said that the B. & O. men shouldn't go on as that engineer and fireman had, the one in his cab on top of the boiler, the other down on his foot board without ever getting an introduction.

Organization was effected by the election of Charles F. Giles, superintendent of machinery of the Louisville & Nashville, and formerly in the B. & O.'s mechanical department, as president, and Charles L. Sullivan, sales manager of the Cowles-McDowell Engineering Company, formerly in the B. & O.'s drawing room, as secretary.

A committee composed of S. M. Dolin, J. Snowden Bell and A. Gordon Jones, was appointed to choose a name for the organization and draft a constitution and by-laws, and to submit them to the members by correspondence. The club will act on them next year. Its meetings will be held annually on the second day of the week in which the Master Mechanics' convention occurs.

The following attended the meeting yesterday:

Charles F. Giles, now superintendent machinery, L. & N., formerly in the B. & O.'s mechanical department; S. M. Dolan, now with American Car & Foundry Company, formerly in mechanical department; George A. Nicol, now with Johns-Manville Co., formerly in drawing room, Mt. Clare; Frank T. Hyndman, now with S. F. Bowser & Company, formerly in mechanical and operating departments; John Tonge, now retired superintendent motive power, formerly in mechanical department; B. M. Carr, now with American Car & Foundry Company, formerly in mechanical department; R. F. Kilpatrick, now with Ewald Iron Company, formerly in mechanical department; A. G. Sandman, now chief draftsman, B. & O.; Thomas G. Smallwood, now with Chicago Pneumatic Tool Company, formerly foreman machinery department; S. W. Mullinix, now mechanical superintendent, Second district, Rock Island Lines, formerly in machinery department; John B. Kilpatrick, now mechanical superintendent, First district, Rock Island Lines, formerly in mechanical department; Walter D. Thomas, now president A B C Bearing Corporation, formerly chief clerk to master car builder; Harry Monkhouse, now with Rome Locomotive Works, formerly master mechanic; E. W. Grieves, now with Galena-Oil Company, formerly superintendent car department; J. G. Platt, now sales manager, Hunt Spiller Manufacturing Corporation, formerly in mechanical department; George Moriarity, now master mechanic, New York, New Haven & Hartford, formerly in mechanical department; Joseph Billingham, now with American Locomotive Company, formerly master mechanic; J. W. Brewer, now master mechanic, Mt. Clare shops; G. A. Schmoll, now superintendent motive power, Wheeling; J. Kirkpatrick, now master mechanic, Newark; J. M. Shay, now general car foreman, Cincinnati; W. M. Bosworth, now mechanical engineer, Kansas City Southern, formerly in mechanical department; C. M. Thompson, now with C. M. Thompson Manufacturing Company, formerly draftsman; A. Gordon Jones, now with General Railway Supplies, formerly superintendent, Harper's Ferry and Valley division; John S. Mace, Philadelphia, formerly in mechanical department; R. W. Salisbury, now motive power inspector, Cincinnati; J. Snowden Bell, now patent attorney, New York, formerly in mechanical department; Charles L. Sullivan, now with Cowles-MacDowell Engineering Company, formerly in drawing room, Mt. Clare; E. L. Weisgerber, now retired, formerly master mechanic, Mt. Clare; R. Onderdonk, now engineer of tests, B. & O.; J. W. Fogg, now master mechanic, Chicago Terminal, formerly in mechanical department; John F. Mercer, now retired, formerly in mechanical department; E. W. Dill, William H. Shipley, B. N. Hawkins, C. E. Walker, William Sinnott, C. E. Calahan, George W. Coyle, George Rule, O. Shellhorn.

The Kalgan-Suiyuan line, China, is to be extended by the government within five years to Ilifu, the capital of China's most distant province on the Russian frontier, a distance of about 2,000 miles. This enterprise was first projected by Tang Shao Yi, and was seriously considered about the time of the completion of the Peking-Kalgan line. The enormous expense of the undertaking, however, caused the enterprise to be held in abeyance. Recent events have led to the present determination to build the line as soon as possible. The expense, of course, will be enormous, but there is strong probability of its commercial success from the beginning. There is heavy caravan traffic between North China and the country in question, which is known as the New Dominion, and the possibility of diverting much of the tea traffic with Russia to this route is promising. Possibilities of developing grain country also are immense. However, the line would probably not be justified at this time except as a governmental undertaking. Up to the present, it does not appear that this enterprise is to supersede the proposition to extend the Kalgan line to Kiahtka via Urga. The ultimate plan of the Kalgan-Suiyuan line is for it to connect with a north and south line bisecting Shansi province, though at latest report there was no definite work being done on this road. Chinese merchants are projecting a light railway from Harbin to Shuihue and Huilun, about 150 miles, for which 5,000,000 taels are being raised. The native press reports that of this sum 3,000,000 taels has been pledged by two native banks, and merchants are to furnish the balance. Aside from work commenced before present conditions developed there is little actual advancement promised in that portion of the country. Nevertheless it is there that railway enterprise is likely to have its best returns both to the investor and to the country.

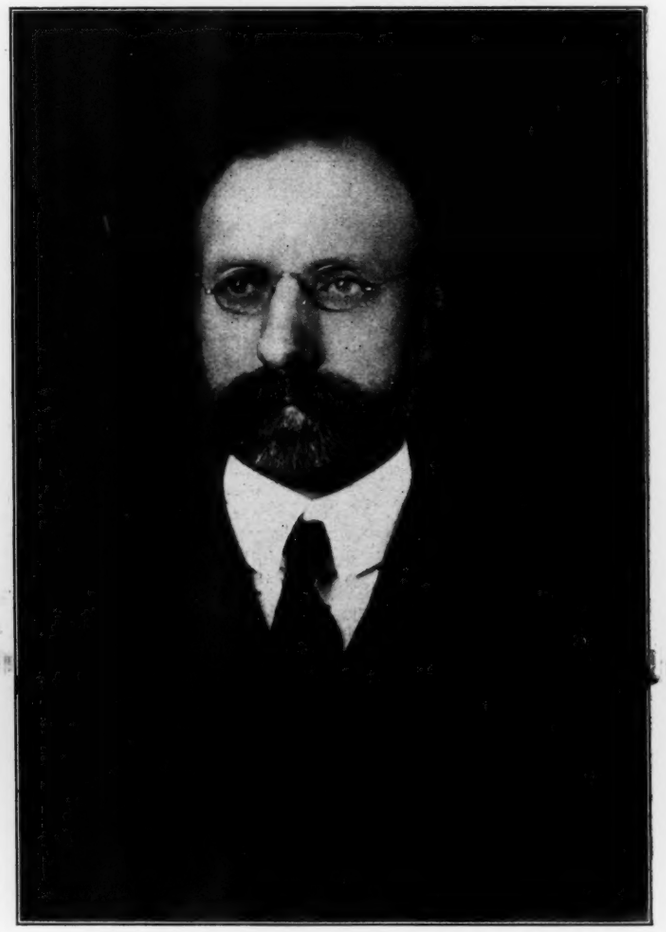
Proceedings.

The first session of the forty-fifth annual meeting of the American Railway Master Mechanics' Association was held on June 17. Vice-President D. F. Crawford called the meeting to order at 9.45, in the absence of President H. T. Bentley who was absent from the meeting on account of illness. The past-presidents of both the Master Mechanics' and Master Car Builders' Association in attendance took seats on the platform. Rev. Dr. William Spurgeon, of London, England, opened the exercises with prayer. In the absence of Mayor Bacharach, of Atlantic City, the address of welcome was omitted and the president's address was read by the secretary.

ADDRESS OF PRESIDENT BENTLEY.

It is a pleasant duty and privilege to address you to-day, and welcome you at this opening of the forty-fifth convention of the American Railway Master Mechanics' Association, and the seventh consecutive one to be held in this beautiful city.

H. T. BENTLEY,
President, M. M. Association.



T. RUMNEY,
Second Vice-President, M. M. Association.

I feel grateful for the honor you have conferred on me, and hope it will be my good fortune at this time, and in the future, to uphold the dignity and prestige of the association, and to follow in the footsteps of my distinguished predecessors in office.

We are glad to see so many ladies here this morning, for their presence shows they are interested in the work that is being done by those near and dear to them, and a convention without ladies would be a very uninteresting affair, or as one man put it, like lemonade without sugar.

I wish to express my heartfelt thanks to the officers and members of the association who have done so much toward making the convention a memorable one; to the officers and secretary who have so cordially helped me, and to the members who have prepared papers on the various subjects, which I hope will be fully discussed to bring out the best there is in them; to the reverend gentleman who so ably opened the convention with such an uplifting prayer; to the exhibitors who have brought here, for our benefit one of the most comprehensive collections of tools, supplies, machines and apparatus that has ever been gathered together; to the members of the Supply Mens' Association who have cooperated with us in providing the entertainments and amusements; to the Hotel Mens' Association for the splendid manner in which they have taken care of us and made us feel so much at home; and to the members of the press who have helped us individually and collectively; the press we are indebted to for keeping us in touch with what is going on all over the world, and without its help we might perhaps be making the same mistakes that other people have made and paid for by dear experience.

In looking over the splendid exhibits brought here for our inspection, I wish to draw your attention to the increase in floor space taken, this year 82,148 square feet being allotted, which is an increase of 6,038 more than last year. As you will notice, greater taste has been displayed in arranging the booths, and I believe nothing has been left undone to make it the most successful display that we have ever looked upon.

At our last convention, I had the pleasure of responding to an address of welcome from your late Mayor, F. P. Stoy, and at that time expressed the hope that he would be with us in the same position as long as we held our conventions here, but as you are probably all aware, Mr. Stoy was taken away from us July 22, 1911, at Wernersville, Pa. The American Railway Master Mechanics' Association owe a debt of gratitude to him for the lively interest he took in our comfort and welfare, and I cannot allow this opportunity to pass without adding a tribute to his memory.

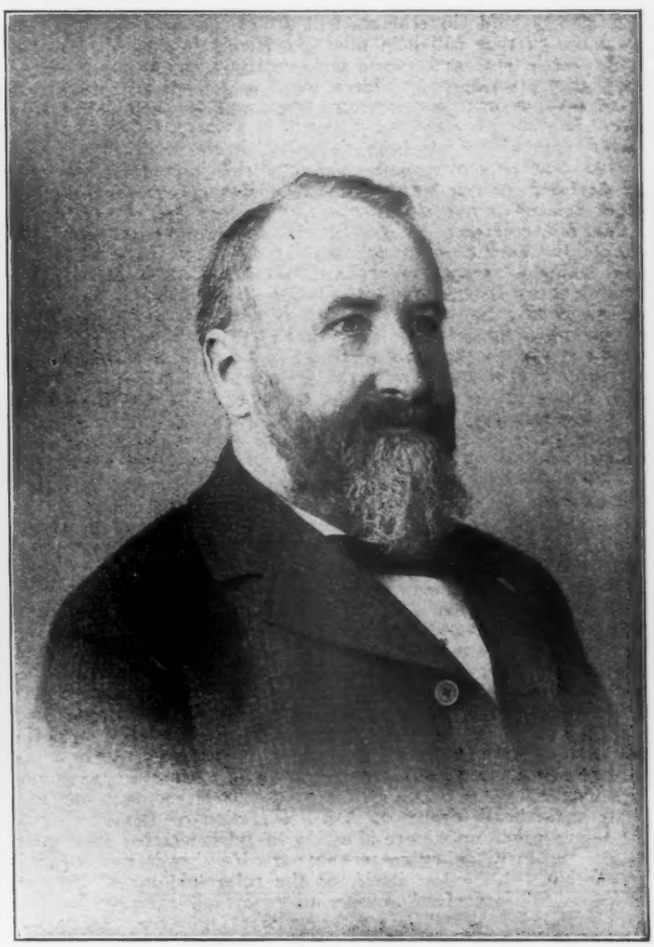
With the tremendous growth of the Association during the past few years, considerable criticism has been heard from various quarters as to the increase in cost, extent, and

amount of entertaining done by the Supply Men's Association, and some people have felt that the formal functions were increasing in formality and the expense was becoming burdensome.

At a joint meeting of the executive committees of the M. C. B., A. R. M. M., and Supply Men's Association, held at New York, October 24, 1911, the question of entertainment was fully discussed, and the committee expressed itself as being under great obligations to the Supply Men's Association for the splendid manner in which they had catered to our pleasure in the past, but it was felt that we could no longer expect them to carry all of the burden and arrangements were made to dispense with the most formal features, such as the reception and ball, substituting informal dances, concerts, etc., where people could thoroughly enjoy themselves; in doing this it was felt that the members and their families would get better acquainted, which is something very much to be desired, and it is sincerely hoped that every one will do their utmost to make things pleasant for one another.

In regard to the cost of entertaining, it was decided that

DONALD R. MacBAIN,
Third Vice-President, M. M. Association.



ANGUS SINCLAIR,
Treasurer, M. M. Association.

our Association would bear its share with the M. C. B. and Supply Men's Association, and thus relieve the latter association of an expense which properly does not belong to it.

The question of consolidating the two association has been discussed since the last convention, but the feeling of the members generally, appears to be against anything of the sort being done; the thoughts expressed are to the effect that after forty-four years of good service, it hardly seems wise that the American Railway Master Mechanics' Association should lose its identity. It was my thought, however, that the wo conventions could be held in one week, Monday and Tuesday being set aside for the Master Mechanics' meeting; Wednesday for a joint meeting of the two associations to discuss matters of common interest, and Thursday and Friday for the Master Car Builders' Association. The principal reason for consolidating is to reduce the time away from business, the present arrangement breaking into two weeks for those attending both conventions, but by handling it as suggested, the duplication of work would be avoided by the joint session, and only five days would be taken up with both meetings.

A suggestion was made on the floor of the General Foremens' Association last year that the members be allowed to investigate and report to the Master Mechanics' Association upon matters pertaining to shop methods and practices, the statement being made that there might be numerous details in shop organization which we were desirous of obtaining information about, but for lack of time had to pass up, and which they were willing and anxious to investigate and report on if asked to do so. This offer was laid before the executive committee who will probably take advantage of it.

Apart from the experience gained at our meetings through the discussion of the various subjects presented, the opportunity for exchanging ideas among members, when outside of the Convention Hall, is great. I am a warm advocate of meetings of this kind, and know personally that valuable information can be obtained from people who have, perhaps, gone through some experiences that we are lacking. As expressed at various meetings and places, I believe we should insist on our men attending conventions; it broadens their ideas, gives them new thoughts and puts fresh life into them, so that on their return to business they are better able to grapple with the problems that confront them.

I was fortunately able to attend the annual convention of the International Railway Fuel Association in Chicago last month, and listened to some of the best papers on the proper firing of locomotives, proper drafting of locomotives, etc., that I ever heard; the discussions were entered into with enthusiasm, and it was, throughout, a real live convention, our master mechanics and road foremen who attended going away with new ideas for the economical use of fuel in locomotive service. For a four-year-old association it is making wonderful strides, and it is deserving of encouragement.

The question of promoting safety in the operation of railways

has received a tremendous impetus lately. About eighteen months ago an organization was started on the Chicago & North Western Railway, in a very humble way, for the purpose of trying to reduce the number of accidents that were occurring daily on our tracks, in the movement of trains and in our shops and roundhouses. The plan worked out so well under the forceful leadership of the general claim agent, and with the assistance of the members of the central safety committee and the local committees on the various divisions, and the results were so gratifying, that the scheme was quickly taken up by all of the large roads in the country, and now, fortunately, nearly everybody has acquired the "safety" habit, or as one road tersely sets forth, "It is better to be careful than crippled."

At one time it was thought that most accidents were inevitable, but when live safety committees got into action it is remarkable how quickly this idea changed, and a reduction in 16 months (the latest date for which figures are available) of 107 persons killed and 3,996 persons injured on the Chicago & North Western, shows what can be done when men make up their minds that it is better to cause a delay than to cause an accident. The fact that it is possible to make such a remarkable showing has induced the railway commission of Indiana to ask all the roads in that state to go and do likewise. Before long the Federal Government will probably step in and call for some action that will help this good cause along; if it would only pass a trespass law and enforce it, a large number of the 5,000 men, women and children who are now being killed each year, because of the dangerous track walking habit would be saved.

The past winter has been the most severe in years, as most of us know to our sorrow, and now that summer is here, we must remember our weaknesses and fix our fences before another winter comes along. In the summer we are liable to forget the cold weather, but that is the time to remember it, and taking advantage of the experience gained, to profit by it. It is only by having the engines and roundhouses in first-class condition that the best results can be obtained, and I am sorry to say when the weather is warm we are likely to forget some of the things we promised to do when we were in trouble.

The last year has seen some serious labor difficulties which fortunately are now a thing of the past. The coal strikes in this country were settled without the serious conditions that existed abroad. The engineers of the eastern lines made demands for certain increases, which are being settled by arbitration.

The Federal boiler inspection bill has now been in operation nearly a year, and, generally speaking, we have become accustomed to its provisions and requirements. The extra expense involved is enormous, but, if through its operation the maximum safety is gained, it will be money well spent. There appears, however, to be a number of differences in the rulings made by the Inspectors, which is to be expected on account of so many new men being employed, and I believe a committee should be appointed to wait on the chief inspector, to try and bring about greater uniformity, discussing some of the things with a view to a better understanding being arrived at, and also to suggest that we dispense with having to do things that do not improve the safety of the boiler at all. Some of the inspectors' reports sent to our general officers from the chief inspector, cause considerable worry and anxiety, from the fact that they assume, when a report is sent from a government inspector, that their attention is being drawn to some infraction of the law, or a dangerous condition we are allowing to exist, whereas it may be only a statement referring to some trouble that is not covered by anything in the law itself, or the rules laid down for our guidance. It is perfectly proper to report all cases where the law is violated, but the fact that a flue is leaking on an incoming engine, or some other equally trivial defect exists, should not, it seems to me, be sufficient cause for a government report to be made, especially to our general officers.

The progress in locomotive construction appears to have kept pace with the requirements, but nothing of a freakish design has been seen. The most radical departures noticed are the turbing locomotive, built and put in service at Milan, Italy, and the turbine electric locomotive constructed by the North British Locomotive Company. Dr. Diesel is also reported as having designed an electric locomotive, the generator being operated by a Diesel engine. So far, however, nothing definite has been heard of their performance.

The question of fuel economy is of greater importance than ever. The railways and locomotive builders, however, have had this before them, and a large number of Mikado engines have been built, which while pulling very little more tonnage than a consolidation engine, have done it with a decrease in coal consumed for the work performed.

In some places Mallet engines have displaced consolidations with remarkable success in the way of increasing the train load, reducing the number of trains, and doing the work with a reported saving of more than 40 per cent. in the amount of fuel burned over other engines engaged in similar service.

The superheater engine has given a good account of itself during the past few months, and the results obtained last winter, were, generally speaking, very satisfactory. While we have had troubles on account of lubrication, headers leaking, etc., we are overcoming them successfully for the reason that our education has been improved by our difficulties and where regular men are employed, they soon become familiar with the different conditions brought about by the higher temperatures, so that no more trouble is experienced with superheater than with saturated engines, the improved results justifying the regular crewing of power, where possible.

Several switch engines have recently been equipped with superheaters and excellent results in the way of fuel and water economy are reported. It would seem that the best results in superheating could be obtained by an engine that is working practically up to its capacity most of the time, and not one in switching service, working intermittently, as most of them do, but the satisfactory service reported as being obtained by superheater switch engines would indicate a field for the device in that kind of work.

While nothing very new has been developed in the stoker line, steady progress has been made with the few that we consider have passed the experimental stage, and a number of Mallet engines have, during the past year, been equipped with them, in one case over 9,000 lbs., of coal per hour having been fed into a locomotive firebox by a mechanical stoker.

The question of efficiency in our shops has not been lost sight of. Careful investigations are constantly being made tending to increase our output and decrease cost, and in this we are being ably assisted by the tool and machine manufacturers, who are very much alive to our requirements

The headlight question is still a very serious one for us; lack of uniformity in state and railway requirements making it difficult to know what to do for the best. The difference of opinion among railways as to what should be used is perhaps justifiable, for the reason that what would be entirely satisfactory on a busy double or four track road with block signals, might not be suitable for a single track road with very little traffic and no automatic signals, and it would be far better for the various states to call for a minimum requirement, that would be low, so as to be suitable for a double track road, and then those roads that felt a brighter light was necessary in certain sections, could provide it

There appears to be considerable progress in the welding up of locomotive broken parts, firebox sheets, etc., by the use of electricity and oxy-acetylene, and a large number of engines that would ordinarily have required new firebox sheets have been kept in service by repairing defects in the old ones. The welding of flues in place is probably going to be a solution of the failures due to flues leaking.

Considerable interest is being taken in the tests of boiler fireboxes of different designs at Coatesville under the direction of our good friend, Dr. Gross; but so far, results of these tests are not forthcoming and we cannot yet say whether the standard design of box will have to give way to one of entirely new shape and form.

Elaborate locomotive tests have been made on the Altoona testing plant in connection with the Chicago committee on smoke abatement to see what effect the different locations of air tubes with steam and air jets in the side of the firebox will have on the amount of smoke emitted; also what benefit is derived from brick arches, air openings in firebox door, etc. When the results of these tests are tabulated, a very useful work will have been accomplished.

The association has a membership of 1,085, which is an increase of only 25 over last year. I believe that all members should try and get this up to 1,300 before another convention takes place.

The National Conservation Congress invited the American Railway Master Mechanics' Association to send a representative to meet with it as a member of an advisory board, and your executive committee instructed me to accept the invitation and take part in the deliberations. The first meeting was held at St. Louis, Saturday, May 11, at which time it was learned that 35 national associations had accepted the invitation to act on this advisory board, which was formed to co-operate with the executive committee and suggest means for furthering conservation in all directions. While the original scope of the congress was to conserve the national resources, such as minerals, water, forests, etc., it was decided at this year's convention that it would be entirely proper to branch out and make a special effort in the direction of conserving vital forces, and this plan of conservation will be brought into prominence at the next meeting.

Questions were asked the attending members as to what

their associations were actually doing in the way of conserving our national resources, and for our association I was able to tell of the improved designs of locomotives that performed a given amount of work with less fuel than other engines of earlier types; the greatest stride in economy that had been made since railways were first put into use was the superheater, which makes a possible saving of nearly one-fourth of the amount of coal used while the engine is working. Also told them what the various railway safety committees were doing in the way of conserving vital forces, and urged the passing and enforcing of trespass laws so that the annual toll of more than 5000 men, women and children killed while trespassing, could be stopped, or at least materially reduced.

In conclusion, I sincerely hope that our visit here will be beneficial to the companies we work for, and that the few days spent at the seaside will so brace us up that on our return to business we will take a fresh hold of things and accomplish so much more that our short absence from duty will be greatly offset by the new ideas put into effect, greater vim and vigor injected into the business, and, in fact, a general improvement in all directions.

ASSOCIATION BUSINESS.

Secretary Taylor presented his report, which showed that the present active membership is 1,024, the associate membership 21, and the honorary membership 40, making a total of 1,085. Te report of the treasurer showed that the association had purchased 50 New York City 4¼ per cent. bonds for $5,187.17, and that there is a cash balance on hand of $1,533.38.

The report of the secretary and treasurer was referred to an auditing committee made up of J. W. Fogg (B. & O. C. T.); W. E. Dunham (C. & N. W.), and C. H. Rae (L. & N.).

The dues for the current year were fixed at $5.00 per vote as heretofore.

F. C. Thayer, general road foreman of engines, Southern Railway, was present as a guest of the association, representing the Travelling Engineers' Association. He was given the privilege of the floor.

ADVISORY, TECHNICAL.

G. W. Wildin (N. Y., N. H. & H.), chairman: The committee has discussed this matter in its various phases, and we seem to stand in about the same position as we did a year ago. The failure of the two associations to consolidate, has, in a great measure, handicapped this committee, and as it will be almost useless for the Master Mechanics' Associations to have the committee, as recommended in my address of 2 years ago, to represent the mechanical fraternity, as well as the Master Mechanics' Association, and also the fact that the chairman of the committee on railway operation and legistation has in the past year selected men to perform just about the same work, and selected them more with reference to geographical location, which will make it easier for them to get to, and from the place of investigation, I don't know but what this is probably about the best way to handle it at this time; and we feel that the matter should be dropped at this time, and recommend that the committee be discharged.

J. F. DeVoy (C. M. & St. P.): I recommend that the report of the committee be accepted, and the committee discharged with the thanks of the association. (The motion was carried.)

MECHANICAL STOKERS.

The committee pointed out last year that the principal benefit to be derived from the utilization of a perfected stoker fulfilling the requirements specified was the realization of the maximum boiler capacity of locomotives with the ultimate result of increasing their hauling capacity and reducing their cost of operation per ton mile of service rendered.

The actual service performance of two stokers complying with the specifications laid down in last year's report, as developed by extensive inquiry among railways who have heeded the committee's request by lending their aid and installing a limited number upon large locomotives, justifies the committee in now reporting that these two stokers have, in a measure, fulfilled its expectations, inasmuch as the indications are that their service has been sufficiently reliable in practical operation on a large number of heavy locomotives. These stokers are the Crawford Underfeed Stoker, which was described in the American Railway Master Mechanics' Association Proceedings for 1910, volume XLIII, and the Street Overfeed Stoker described in the American Railway Master Mechanics' Association Proceedings for 1910, volume XLIII.

Both types of stokers in successful service to-day maintain the same general principles in design originally employed. The improvements made on them, which resulted in making their operation practicable, are improvements of detail only, such as would result from the knowledge gained of the weakenesses of individual details brought out by actual service.

As the greater sustained tractive efforts of the large engine equipped with superheaters and brick arches is gradually taken advantage of, its fuel consumption per hour will increase, though decreasing on the ton-mile basis, with the eventual result of possibly making necessary to some extent means, in addition to those already provided, to supply fuel to the engine up to its maximum requirements. When this condition develops, as it is bound to, by traffic increases, careful investigation of tonnage ratings, and the raising to a higher standard the efficiency of operation, the demand for a perfected type of mechanical stoker will become more acute than ever. It is, perhaps, somewhat of a good fortune that the superheater has stepped in and tided over the difficulty that would have resulted while the stoker was in process of development and the demand for large engines becoming more insistent.

CRAWFORD UNDERFEED STOKER.

This stoker, in service on the Pennsylvania and the Baltimore & Ohio, has been developed into a practical operating machine, and is being applied to all of the large Pacific type

T. RUMNEY,
Chairman, Committee on Mechanical Stokers.

class K-2 passenger locomotives and the consolidation class H-8-C, freight locomotives building for the Pennsylvania Lines west of Pittsburgh. On these lines forty-five locomotives are now equipped, and twenty locomotives under construction are being equipped. The Lines East have ten locomotives equipped. The Baltimore & Ohio reports one Crawford stoker in service on a Mallet engine with a grate area of 100 sq. ft., and a tractive power of 105,000 lbs., working compound.

The forty-five locomotives on the Pennsylvania Lines West, which include some of the earlier designs, have made a total of 7,361 trips up to the middle of March, of which 3,640 were 100 per cent. stoker fired, 2,082 between 75 and 100 per cent. and 1 639 below 70 per cent. The per cent. stoker fired is in reference to the amount of coal put into the fire box by the stoker; as for instance, a 90 per cent. stoker fired trip means that the stoker fired 90 per cent. of the coal while 10 per cent. was hand fired, the firing by hand being done to fill up spots in the grates which resulted from imperfect distribution of the coal by the stoker. Some capacity tests on the Western Division of the Lines West were run with a dynamometer car on various passenger locomotives, one of which was a Pacific type equipped with a Crawford stoker. The results of these tests have not been completed so as to become available for this report, but the preliminary figures indicated, with respect to the coal con-

sumption, that the stoker made as good a performance as the skilled fireman selected for the hand-fired locomotives.

The Crawford stoker applied to the Mallet engine of the Baltimore & Ohio has been in service about a year. Some difficulty was experienced with this stoker due to the fact that some departures in design were made from the stoker as originally developed, consisting principally in the provision of two cylinders to operate the plungers instead of one. This necessarily added certain complications which subsequently gave trouble. After certain changes, the stoker gave a fair distribution of coal. This stoker is still in service but has not given quite the satisfactory performance so that it could be termed unqualifiedly successful. Inasmuch as this particular stoker is a modification of the Crawford stoker as now perfected for engines of the type to which it has been applied on the Pennsylvania Lines, some difficulty, as experienced with it, might reasonably be expected.

STREET OVERFEED STOKER.

This stoker is now being built in two somewhat different forms, distinguished from one another as the screw conveyor type and the crusher type. The screw conveyor stoker is built to take screened coal from the tank and distribute it evenly over the grates in the firebox without being handled by the fireman. The coal used by this machine must be passed through a screen having 2-in. square mesh before it is placed on the tank. With this type of machine the fireman has no manual labor to perform excepting that of raking the coal on top of the screw conveyor when the supply in the tank is low.

The crusher stoker is designed to take lump, run-of-mine, or slack coal from the tank and distribute it over the grates in the firebox. With this type of machine, all the coal must be scraped or shoveled into the crusher by the fireman. The parts of the stoker on the back boiler head and the distribution systems are the same with both machines. The primary difference between them is in the means provided for conveying the coal from the tender to the distribution system, the screw conveyor type only needing one engine to operate the entire machine, whereas the crusher type needs two; one for the crusher, the other for the conveying mechanism.

It is the opinion of the designer of the Street stoker that the provision of means for preparing coal on the tender for suitable firing is but a temporary expedient to be used with experimental machines, and that for practical operation of a large number of stokers, it would be more feasible to prepare the coal at the chutes suitable for stoker firing before delivery to the tender. The committee last year recommended that a stoker, in order to be complete, should be able to handle run-of-mine coal. In this respect the Street screw conveyor of stoker does not meet the committee's recommendations. The indications, however, are, judging from recent developments, that it will be more economical to concentrate the means for properly preparing coal for stoker consumption at the coal chute with the net gain of reducing to a minimum the complication of a machine which, when applied to a locomotive, will of necessity add to the expense of locomotive maintenance and the likelihod of engine failure.

There are 30 Street stokers applied and in service today, 13 of which are of the crusher type and 17 of which are of the screw conveyor type. Sixty-nine stokers of the screw conveyor type are under construction for application to 45 Mallet engines ranging in tractive power from 72,800 lbs. and 99.5 sq. ft. grate area to 105,000 lbs. tractive power and 100 sq. ft. grate area, and 24 Mikado engines of 60,800 lbs. tractive power and 66.7 sq. ft. grate area. The thirty stokers in operation are applied to engines ranging in size and type from 45,700 lbs. tractive power consolidation freight, 58,000 lbs. tractive power mountain passenger, and 60,700 lbs. tractive power Mikado freight to 105,000 lbs. tractive power Mallet freight and pusher engines. At the last convention of this Association, eight of these stokers were in operation. From the service rendered by them, as well as the results of individual investigations made by various roads, this number has grown to 30, with 69 under construction for entry into service within the next few months.

General inquiry of different roads which have the latest type of Street stoker in service has developed the facts that its service is satisfactory, as indeed is attested to by the extension of its use; that it permits realizing the fullest capacity of the locomotive boiler; that it permits of carrying a thinner fire than ordinarily possible with hand firing; that with considerate attention, it renders practically uninterrupted service; but that it does not necessarily effect economies in fuel consumption. The fact was also developed that the greatest trouble in the operation of this stoker results from the unfamiliarity of engine crews with it at the time of introduction. It takes considerable drilling to get a sufficient number of men on a division trained so that the stoker may be handled successfully in pool service. This difficulty, however, is a minor one, and naturally follows at the outset of the use of a device new in railroad service. As the stoker becomes more generally utilized, this trouble will disappear.

HANNA OVERFEED STOKER.

This stoker, as far as developed, was briefly reviewed in the Proceedings of the American Railway Master Mechanics' Association for 1911, volume XLIV. It did not fully meet the requirements of the committee. As a coal-distributing means, the Hanna stoker has successfully demonstrated its possibilities. It has been in continued service on engines of the consolidation, Pacific and Mallet types, giving a good account of itself, particularly when the engine crews tok a personal interest in its operation. The manufacturers of the Hanna stoker are revising its design and construction so as to increase the scope of their apparatus to comply with the specifications as laid down by your committee.

THE BARNUM UNDERFEED STOKER.

This stoker as developed so far by the Chicago, Burlington & Quincy employs screw conveyors located in troughs extending longitudinally just below the grates. The screw conveyors decrease in diameter from the rear of the firebox to the front. Above the conveyors in each trough are a series of inclined plates, adjustable for height and inclination. The clearance between the conveyor and the bottom of the trough may also be adjusted to secure the best results. The conveyors are operated by a transverse worm shaft under the cab deck which is rotated by two small steam engines secured ont the outside of the frames. A coal crusher on the latest type of stoker as applied to five 2-10-2 type engines recently built for the Chicago, Burlington & Quincy is also provided. This crusher is driven by a small steam engine located on the tender. It delivers coal to a belt conveyor which transfers it to a transverse trough from which it is discharged into the longitudinal feed troughs.

In addition to the five 2-10-2 type engines equipped above, the Barnum stoker has been in service on a switch engine of the Burlington road operating in Chicago, as well as a Prairie type engine operating in freight service. It is reported as having good results with both low grade bituminous coal and lignite. It is further reported that the indications at this time for this stoker are that it is a practical machine, assisting in making steam readily and being free from failures and breakdowns.

DICKINSON OVERFEED STOKER.

This stoker was tried out on the Erie. It employed the fundamental principle of coal distribution of the Hayden stoker further developed. It was equipped with a coal crusher and means for conveying coal, consisting of a screw conveyor transmitting the crushed coal to a bucket conveyor encased in a housing, which bucket conveyor in turn delivered the coal to the distributing mechanism. The apparatus was so arranged that it did not in any way encumber the fire door. The entire machine was driven by two small steam engines, one operating the crusher, the other the conveying apparatus.

The conveying mechanism as well as the distributing device of this stoker were successful, but the coal crusher failed, due principally to its inadequacy. The engines, together with a few minor details, gave considerable trouble, although the complete combination gave a good showing when in proper repair. For it to be maintained in this condition, however, proved very expensive.

From the experience gained from the above stoker, a second one was designed and built, seeking to avoid all the weaknesses of the first while incorporating all its good points. The modified stoker, as finally placed into operation, used only one engine of a special slow speed design, special form of boot, for the elevator carrying all the gearing to avoid encumbering the engine, an improved conveyor, a suitable coal crusher, and better coal distributing means. This stoker was finally placed into operation during the month of February last, applied to a consolidation freight engine. It soon developed that snow and moisture in the coal presented new difficulties by causing the fine coal to dry and cake in the elevator buckets, gradually filling them up, which so diminished the elevating capacity of the conveying mechanism that it clogged and stopped, finally resulting in a failure by breakage of the elevator chain. This trouble was probably due to wrongly designed buckets,

since the bucket elevating system as employed in the Street stoker works without trouble. During the operation of the stoker, steam was satisfactorily maintained and the apparatus worked smoothly. It is now proposed to do away entirely with the bucket elevator scheme and substitute in its stead helical screw conveying means.

CONCLUSION.

Generally speaking, in consideration of the foregoing review of the status of the mechanical stoker, the committee feels justified in concluding that decided progress has been made during the last year in the development of the mechanical stoker. While the perfection of the superheater and the brick arch have assisted in making possible a larger engine, it is considered, judging from these indications, that the advent of the perfected mechanical stoker will make possible a still larger engine.

The report is signed by:—T. Rumney (C. R. I. & P.), chairman; E. D. Nelson; C. E. Gossett (M. & St. L.); J. A. Carney (C. B. & Q.); T. O. Sechrist (C. N. O. & T.); S. K. Dickenson (L. S. & M. S.), and George Hodgins.

DISCUSSION.

W. C. A. Henry (Penna. Lines West): There are in use on the Pennsylvania Lines East and West at the present time, 75 of the Crawford stokers. The performance of these stokers has been so satisfactory that the Lines West have recently ordered 37 heavy freight and passenger locomotives equipped with these stokers. We find we are realizing more power from the locomotives equipped with the stoker than in the case of locomotives where hand firing is used, and altogether our experience is that the stokers are very reliable. On the lines in the southwest we have 10 Pacific type locomotives, which have been equipped with the stokers. During the month of May, 97 per cent. of the coal burned by these locomotives was handled by the stokers, and the remaining 3 per cent. was handled, as explained in the report, in the leveling of the fire, etc. These engines are not assigned to regular crews, but run in a pool.

T. R. Cook (Penna. Lines): We have some figures here showing the results of the performance of the stokers on the lines West that might be interesting. The total number of trips over and above those reported by the committee, is now 11,726, of which over 6,000 were 100 per cent. trips. The detail of the last 2 months performance, I believe would be of interest. The stokers on the Pacific type engines in the last 2 months made 992 trips, out of which 682 were 100 per cent. trips. The consolidated engines with the stokers made 837 trips, out of which 566 were 100 per cent. trips.

We have also on some of the consolidated engines the new design of stoker which has departed from the original design in some of the principal features, *i. e.*, in the surface of the grate. The original stoker had a flat grate. The No. 17 stoker, so called, has a sloping grate, that is, the grate slopes towards the center, with a basket effect. In these engines we have been able to carry a much lighter fire, and a fire which is much more evenly distributed. That stoker has been doing very well. It was only equipped within the last 4 or 5 weeks and the engine has made 41 trips, of which 36 were 100 per cent. trips.

J. F. DeVoy (C. M. & St. P.): Mr. Henry referred to the fact that an engine equipped with a stoker developed greater power than the engine which was fired by hand. I would like to ask if he has made any tests, and can give us any relative information as between the 2 forms of firing, the amount of coal saved in firing, or the increased amount of power derived from the application of the stoker over hand firing. The reason I ask that question is that in a stoker which we tried out a year or two ago, it did not develop the fact that the stoker would increase the capacity of the boiler to any great extent, that is, compared with the hand firing, and for this reason I would like to know if there were any comparisons made by Mr. Henry along these lines.

Mr. Henry: Tests of these locomotives were made on the locomotive testing plant at Altoona, Pa., on which tests 9,400 lbs. of coal were burned an hour. The road tests which we have made indicate that by the use of the stoker, in comparison with hand firing, we get an economy of from 5 to 7 per cent., that is to say, the same amount of work is performed with the stoker, with 5 to 7 per cent. less coal, as is performed by hand firing. Our road foremen of engines also tell me that the Pacific type locomotives equipped with stokers make their schedules more easily, and make up lost time more quickly, than engines which are hand fired.

C. D. Young (Penna.): I believe that I can furnish some few figures on the relative capacity of the hand fired engine, or the possibilities, perhaps, of a stoker fired locomotive vs. a hand fired engine. The committee has referred to the application of the Crawford stoker to the Baltimore & Ohio mallet compound engine. I believe that was the first attempt that was made to apply an underfeed stoker to a fire-box greater in width than 100 in., and the problems involved in the construction were very serious, and required some experience, as we afterwards learned, before the problems could be fully met. The performance of the B & O. stoker gave the designers a great deal of information upon which to base future designs, and with the errors and difficulties of the wide fire-box engines before them, as the result of the application to the B. & O. Mallet, the Pennsylvania road has incorporated on their Mallet simple locomotive & Crawford stoker.

In testing this locomotive out on the Eastern slope between Altoona and Gilitzen, a distance of a little over 13 miles, on a 2 per cent. compensated grade, it was necessary to fulfill the requirements of the locomotive, to burn an average of over 11,000 lbs. of coal per hour. This the stoker did. We are rather inclined to believe, from our experience when the stoker has not been operating satisfactorily, that it would require 2 men to successfully keep the fire going burning coal at that rate, and with a single fire door, it would be even very difficult to have 2 men keep up full steam pressure under maximum working conditions, so I think in the case of this application it is fairly safe to say that the application of the underfeed stoker has permitted the maximum capacity of the boiler at low speed.

We have also applied the stoker to another Mallet compound, which is just about to be delivered from the Baldwin Locomotive Works, and that will be tried this summer, when we will know more about the performance. This machine is different in detail, but the same in fundamental design, from that applied to the B. & O. Mallet compound, and the Pennsylvania Mallet simple. In addition to that, we have applied the type of stoker which Mr. Cook spoke of, with the sloping grate to an experimental Pacific locomotive which we have had for some few months, and have tested frequently on the locomotive test plant, having made a series of some 50 odd tests. I believe that this locomotive represents the latest development in heavy Pacific design. It has 27 in. by 28 in. cylinders, and I believe is about the heaviest 80-in. wheel passenger locomotive which has ever been built. During some of the runs on the testing plant we have burnt a large amount of coal and have developed as high as 2,000 boiler h.p. in the boiler, the boiler being equipped with a superheater and a Crawford stoker. The engine indicated, for sustained power, something over 2,500 i.h.p., which I believe establishes a new record for any passenger locomotive. When the members consider this engine will develop 2,500 i.h.p. and give an evaporation sufficient to be rated as 2,000 boiler h.p., they will appreciate that it is quite a large machine. The engine has not been in service on the road long enough to be put on our heaviest and fastest trains, but we have been breaking it in and trying it on some of the slower trains. The results have been equally satisfactory on the road as on the testing plant, and we have been very much satisfied so far with the results of the operation of the engine.

Thos. Roope (C. B. & Q.): We have done some experimenting with the Barnum stoker, and as far as we have gone with it the results have been satisfactory. We have tested it with both bituminous and lignite coal, and, as you all know, the lignite coal is very light. We find with the Barnum stoker that we are able to maintain maximum steam pressure at all times. It is a splendid device for abating the smoke nuisance. The stoker, I might say, is very popular with the enginemen that have used it. I have been on a locomotive that we have been testing on the Lines West under adverse conditions, and in all kinds of weather, and in all the trips I personally made on the locomotive, the results were very satisfactory.

A. G. Trumbull (Erie): Lately we have devoted considerable attention to the Brewster stoker. Some of the difficulties to be encountered in the operation of that stoker, of course, might be anticipated in connection with the vertical conveyor inside the firebox. We find it rather impossible to operate the stoker on account of the action of the heated gases, on the cast iron conveyor, and after considerable effort to develop means whereby the conveyor could be protected from action of the smoke gases, we were obliged to abandon the experiment. Thus far we have no means whatever of overcoming this difficulty. I think, perhaps, there may be a future for this stoker, if the difficulties enumerated can be overcome.

F. H. Clark (C. B. & Q.): I have an idea that the stoker is going to help us to get the full capacity of our boilers. It is a pretty difficult matter to meet all the requirements called for in firing a locomotive. With some stokers that have been offered, the question of distribution is one of the most serious difficulties that is encountered. We have sev-

eral stokers on the road now that a pear to be doing very well. We have a Street stoker in service in one of our big Mallet engines, with a grate area of about 100 sq. ft. and somewhat to our surprise it made a successful first trip. We are going on and putting some more stokers on that class of engines, as we are very much encouraged from the experience we have had with the first stoker, and which has now been in service perhaps a week, and of which we have heard nothing as yet but good reports.

H. F. Staley (C. C. & O.): I have had in service for about one year one of the Hanna stokers of the older type, applied to a Mallet engine having 78 sq. ft. of grate area. With the use of this stoker I find we can maintain a maximum steam pressure at all time while the engine is working at full capacity. We have experienced some trouble with this engine in regard to its steam capacity while running light, due to the fireman improperly handling the stoker, by the application of too much coal to the fire or feeding the coal to the fire faster than the engine was capable of burning the coal. I consider that this stoker will distribute the coal uniformly over the grates, and with its use we can successfully burn a lower grade of coal, and maintain a maximum steam pressure, much more satisfactorily than can be done by hand firing. The Hanna stoker can be used without a brick arch, and in our case no brick arch was used.

W. H. Williams (B. R. & P.): I do not understand why the Street stoker men are so quiet. I rode on some Chesapeake & Ohio engines which were operating very successfully with the Street stoker. We have a large Mikado engine which has been in service something over three months, in which the Street stoker has been operating all the time without failure.

C. F. Street: I think the committee's report covers the situation in very good shape. I now feel that my machine has passed the experimental stage. I am now running about 150 machines. These are in the service, and all of them are giving satisfaction.

T. Rumney (C., R. I. & P.): Of course, it makes a vast difference as to the size of the engine—whether the stoker works on a low grade line or in a rolling country, and particularly where the limiting grades are short. One of the most important things to be considered is the size of the engine and what work a fireman can do, and also as to various other devices, covering certain classes of service, by which we could decide whether a stoker is necessary or not.

G. H. Baker: Some attention has got to be given to getting men into locomotive service with intelligence and brains, as well as muscle. We have got to have engineers after a while and we have got to make them out of firemen. We have got to make the conditions of firing locomotives such that intelligent young men can be persuaded to enter the work and stay in it, and not be driven out of the service by the hundreds after the first month or two. I think the mechanical stoker has been found to be doing a great deal of good work in that direction, permitting the use of big engines where big engines are needed, and the maintenance of their power in emergencies and hard work up to the maximum.

C. D. Young (Penna.: The question that Mr. Rumney asks is a very important one when a person is trying to decide whether they shall put a stoker on an engine or not, and one exceedingly difficult to answer, it seems to me. Now, the problem on that account depends on circumstances. We have some data which I believe is fundamental on the subject of the firemen. It has been worked up with that in view, and I believe it would be very interesting to the association to know what has been done by firemen, proving what at least can be done, and then from those figures perhaps we might be able to judge what an average man might be expected to do. Last Summer and last Fall some capacity tests were run between Ft. Wayne and Valparaiso, a distance of 105 miles, the idea being to determine just how many cars could be hauled on a given schedule speed. Everything was in good shape for the experimental work. The road foreman recommended a man who has broken all records in handling fuel on the deck of a locomotive. He had fired for 3 hours at speeds greater than 60 m. p. h., an average of 8,400 lbs. of coal per hour. I believe that establishes a record which, unless he tries it over again, will not be beaten. Not only did he do that, but he would go back and do it over again. His work was done with a No. 5 shovel. Had he been given a larger shovel, I believe he could have exceeded those figures. We have had men on our locomotive tests plant fire as high as 9700 lbs. of coal per hour. Now, these are maximum figures, I believe you will all agree with me that we should not expect very much more. We know time and again, men who are firing 3,000 lbs. of coal per hour for a 6 or 8-hour run on the road, and they are doing all we can reasonably expect of a single fireman. I don't believe we can expect from the present day fireman operating a passenger engine, anything greater than 4500 to 5,000 lbs. of coal per hour.

Mr. Street: A fireman told me that he had been firing a consolidation locomotive of comparatively small capacity for 6 years, and when he was given a stoker he put in a full month on the stoker, which was the first full month he had ever put in on one of these locomotives. He said there was not a fireman on any of these locomotives that will work continuously a full month. They must all lay off and rest up for a while. Now, these men were not shovelling more than between 2,500 and 3,000 lbs. of coal per hour on heavy freight work. That is a very indefinite proposition, I understand, but before the next session of the convention, I think we will be able to give positive figures. One of the things which has surprised me greatly is the small quantity of coal required in comparison to what I expected. In a number of cases we have slowed down the speed of conveyor for delivering coal to a point which is much lower than we had anticipated. We have not yet made tests to determine just the quantity which is put in.

Angus Sinclair: It has been said that superheated steam would do away with the need of a mechanical stoker, which is taking a rather short-sighted view of the question. The fact is, when we consider the way in which the size of locomotives has increased; what the maximum of a locomotive may be and what the maximum demand for steam may be, the importance of the stoker is evident. Now, on the Southern Pacific I know for a fact that there are oil burning engines using 150 gals. of water per minute. You have to look forward to getting your coal-burning locomotives up to the capacity of oil-burning locomotives, and if that is the case, it is far beyond the capacity of any man to fire them. For this reason, I think that the demand for a mechanical stoker is liable to increase.

T. Rumney (C. R. I. & P.): Just another item in connection with the use of the stoker that is not being emphasized particularly, and that is a grade of coal that you can use with a stoker. We are burning in some cases washed slags that a man could not possibly fire by hand.

H. A. Gillis: We have a number of stokers doing good work to-day, but there is one thing that has not been brought out and that is in regard to the fireman. I have done some firing myself, and I know the question of the human element does come in. I don't care what a man's physical ability is or what his capacity is, there are times when a man is not fit to do the work. There are times when the temperature is such that hardly any man can fire and make any time.

D. F. Crawford (Penna.): I have naturally thought a great deal about the question Mr. Rumney asks as to what size locomotive we could stop at. We naturally started with the application of the stokers to the heaviest locomotives in the equipment. It has been my idea to work backwards, and take first the largest locomotives we have, then the next size consolidation locomotive, and then go to the locomotives that may be called the lighter passenger locomotives, say a 20½ in. by 26 in. cylinder. I want to do that for two reasons: I hope to gain more efficiency or save fuel, I don't know that I will on the smaller; I also hope to so greatly eliminate the smoke that our suburban trains in coal burning districts will be comfortable to the passenger, and I think that is a point we have got to think of a good deal when it comes to the smaller locomotives. If we succeed in getting a stoker that will reduce the smoke, it will not only be useful on the large locomotives, but on the small locomotives, around terminals. In regard to the determining of the capacity of locomotives; we took some 6-wheel truck cars and loaded them with steel rails until they weighed 62½ tons. We made a schedule of 100 minutes for 105 miles, and started in with trains of 5 cars and worked up to 15 cars. With 15 cars we averaged 58 m. p. h., and with 9 cars we averaged 76 m. p. h.; and the fireman that Mr. Young speaks of was able to handle the amount of coal that he has stated. I found, however, in comparing the daily performance of the two classes of locomotives, one of about 39,500 lbs. tractive effort and the other of 42,000 lbs. tractive effort, the larger engine having a larger boiler, and what we thought more steaming capacity, that the man used about the same amount of coal on both of these engines. It was somewhere in the neighborhood of 3,500 lbs. of coal per hour in freight service, and for a run that extends the same as ours did, for 10 hours, it seems to me it is pretty near the limit; and therefore, from a coal burning standpoint I have thought of applying the stoker to all locomotives that require over 3,500 lbs. of coal per hour.

John Tonge (M. & St. L.): I would like to know if the railway companies are making comparative tests. Now, if there is 5 per cent. to be saved in fuel, it is certainly worth while to have a stoker. I think that the discussion this morning has not been as interesting as it ought to be for the reason that not enough mention is made of the power of the engines using the stoker. There is a preponderance of small power engines, and we ought to consider them if we are looking after money or economy.

A Member: In Pennsylvania we have had 4 consolidation engines in service for less than 3 months. We have been experimenting with the coal. The stokers are new to us, but so far the engines are able to go 45 miles without using a shovel, or without using a hook, the engine in that time burning at the rate of 5,000 lbs. of coal per hour, with a maximum grade of 1 per cent. and a steam pressure of never less than 200 lbs. up to 205 lbs.

C. H. Hogan (N. Y. C. & H. R.): One of the most important reasons for this association and the mechanical men of this country encouraging those advancing the stoker, is that it will enable us to employ young men as firemen with a greater degree of intelligence than we can do to-day. It was almost beyond human endurance for a fireman to work on a locomotive, particularly a freight locomotive, and maintain the maximum pressure on a division of 150 miles. The object of all railways at the present time is to build locomotives with the greatest capacity possible, and in order to get good efficiency from these locomotives I believe we must have a mechanical stoker. We are going to have men in the future for firemen that will give us engineers such as we should have. We must lessen the burden of the fireman. I certainly believe that the time is not far distant when all roads, particularly trunk lines, where they have to haul heavy tonnage will be obliged to equip their locomotives with stokers in order to get full efficiency from them.

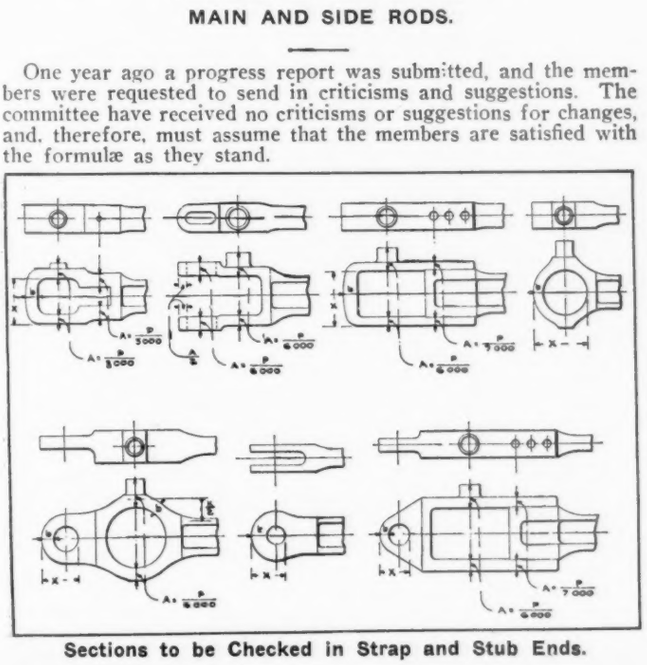
Thos. Roope (C. B. & Q.): I think perhaps we ought to go slow in considering the remarks of the speakers who have just spoken. I doubt if there has yet been a stoker made, with which there could not be found some fault. We have tested the underfeed and the overfeed stoker, and some parts of the reports state that the feed has been very accurate. That I can agree with from observation, but it has not been our experience that you use less coal with a stoker than you do without one. Then again there is no stoker but which has a great number of parts to maintain. That is one thing that we are all trying to keep away from; we want to make our locomotives as substantial as we can, and to avoid delay from break-downs. Some of the stokers are complete in one respect, and it is difficult to figure they are all right otherwise.

W. J. Tollerton (C. R. I. & P.): The question of oil burning on a locomotive versus coal burning will be one which will be soon settled, because of the rapidity with which oil is going out of use, due to the fact that the price has been raised, prohibiting its use as a fuel for locomotives. We have been able to get very much increased service out of a locomotive using oil instead of coal, probably 12 to 15 per cent.—both in carrying capacity and in service on the road. The question, however, of fuel and stokers, I think should receive a great deal of consideration, for the reason, as above stated, that oil, unless the roads own their own wells, will not very long be a factor in fuel.

There was no report on the Revision of Standards and the committee on specifications for cast-steel locomotive frames requested more time which was granted. Wm. Forsyth (*Railway Age Gazette*) suggested that the latter committee request the American Society for Testing Materials to prepare a special specification for a locomotive frame.

MAIN AND SIDE RODS.

One year ago a progress report was submitted, and the members were requested to send in criticisms and suggestions. The committee have received no criticisms or suggestions for changes, and, therefore, must assume that the members are satisfied with the formulæ as they stand.



Sections to be Checked in Strap and Stub Ends.

CHECKING FORMULAE.

All measurements are given in inches and pounds.
A = Area of section considered.
a = Width of section considered.
b = Depth of section considered.
C_1 = Max. compression unit stress for transverse bending.
C_2 = Max. compression unit stress for vertical bending.
c — c_1 — c_2 = Coefficients.
d = Cylinder diameter.
L = Length of rod from centre to centre of pins.
M = Bending moment.
P = Max. compression strain acting at end of rod.
p = Max. boiler pressure.
Q = Cylinder pressure = 0.7854 d^2 p.
R = Radius of driving wheels.
r = Radius of crank.
RG = Radius of gyration of section—axis horizontal.
rg = Radius of gyration of section—axis vertical.
S = Stress—and where used in formulæ must not exceed one sixth of ultimate strength of the steel.
s = Amount of horizontal offset in rod.
SM = Section modulus of section considered—axis horizontal.
sm = Section modulus of section considered—axis vertical.
W = Weight on pairs of drivers actuated through rod considered.
Main rod area must not be less than P ÷ 10,000 lbs.
For main rods $P = Q$.
For side rods $P = \frac{0.3\ WR}{r}$

To determine C_1 and C_2, calculations should be based on a section half way between rod pins.

For transverse bending in rods having knuckle pins flexible transversely

$$C_1 = \frac{\frac{P}{A}}{1 - \frac{P\,L^2}{675\,000\,000\ A\ rg^2}}$$

For all other rods

$$C_1 = \frac{\frac{P}{A}}{1 - \frac{P\,L^2}{1\,200\,000\,000\ A\ rg^2}}$$

For vertical bending in all rods

$$C_2 = \frac{\frac{P}{A}}{1 - \frac{P\,L^2}{300\,000\,000\ A\ RG^2}}$$

Values for C_1 and C_2 can also be taken from tables in "Kent's Pocket Book" under heading "Merriman's Rational Formula for Columns."

First—For rods without offset the larger value of C_1 and C_2 should be taken equal to S.

For rods with offset the larger value of $C_1 + \frac{Ps}{sm}$ and C_2 should be taken equal to S.

Second—$S = C\ \frac{AL^2r}{SM} + C_1\,P\left(\frac{1}{A} + \frac{5}{sm}\right)$

The calculations should be based on a section located at a distance 0.6 L from crosshead pin for main rods and halfway between pins for side rods.

VALUES OF C AND C_1.

Rev. per min.		256	325	375	420
Main rod	c =	0.036	0.055	0.073	0.091
	c_1 =	0.500	0.500	0.400	0.300
Side rod	c =	0.071	0.106	0.142	0.177
	c_1 =	0.500	0.500	0.500	0.500

The co-efficients selected should correspond with the highest number of revolutions per minute which the locomotive can make.

If this cannot be determined, use
420 r.p.m. for high speed passenger locomotives.
375 r.p.m. for passenger and high speed freight locomotives.
325 r.p.m. for all other locomotives.

Very simple rules for rods, without offset, and having bodies with rectangular section, based on the above theory, follow.

First—Stress is less than one-sixth of ultimate strength of the steel if "L" is less than 46 "a" or 23 "b" and if "A" is more than "P" divided by one-eighth of ultimate strength of the steel.

Second—$S = c_2\ \frac{L^2r}{b} + C_1\ \frac{P}{A}$

VALUES OF C_1 AND C_2.

Rev. per min.		265	325	375	420
Main rod	c_2 =	0.22	0.33	0.44	0.55
	c_1 =	0.50	0.50	0.40	0.30
Side rod	c_1 =	0.43	0.64	0.85	1.06
	c_2 =	0.50	0.50	0.50	0.59

The allowable stresses for the various sections of rod ends are given in connection with the diagrams following, except where thickness of section is indicated by the letter "b." The figures denote maximum stress allowed under end load "P." If the minimum areas of the two members differ, take double the lesser area for "A."

The minimum area at points indicated by letter "b" should be—

$$\text{For main rods—}A = \frac{PX}{30\,000\ b}$$

$$\text{For side rods—}A = \frac{PX}{60\,000\ b}$$

In which "x" is the average diameter of eye or average spread of jaw members.

The above checking formulæ is therefore submitted as recommended practice.

The report is signed by:—W. F. Kiesel, Jr.(Penna., chairman; H. Bartlett (B. & M.); G. Lanza (Bald. Loco. Wks.); H. B. Hunt (Am. Loco. Co.) and W. E. Dunham (C. & N. W.).

DISCUSSION.

O. C. Cromwell (B. & O.): We have some advantage in increasing the fillets joining the sections to the stub, making a very much larger radius. That does not appear to be covered in this report.

W. F. Kiesel, Jr. (Penna): The question of the connection between stubs and rods has not been specially considered. It is generally conceded that it is necessary to make a transition from the body of the rod to the stub gradually, so as not to contemplate deflections at that point.

C. A. Seley (C. R. I. & P.): There are a great many questions in connection with the design of these parts of locomotives. I have had some experience on one class of engines, with rods. It has not been a very satisfactory performance, and identical rods of another class have failed; being a different lot they possibly were affected by a different chemical composition. There are a number of elements entering into the matter beyond the one which is explained. In the short time I have had this paper I have found it difficult to intelligently discuss it. I therefore move that the paper lay over for a year for consideration, and be brought up then for the adoption of a standard, inasmuch as we do not have a recommended practice in the association.

The motion was carried.

SAFETY VALVES.

(1) The committee on safety valves herewith submits the following report: The suggestions given below apply to oil and coal burning locomotives, whether using superheated or saturated steam. Safety valves suitable for the requirements of coal-burning locomotives should be ample for those burning oil, inasmuch as the enginemen have control of the fire of an oil-burning locomotive to a greater extent than on coal burners.

W. J. TOLLERTON,
Chairman, Committee on Safety Valves.

(2) *Formula for the Size of Valves.*—In view of the variation in the various makes of safety valves as regards lift, any formula for the size of valve should take this item into consideration. No change should be made in the formula proposed by the committee of this Association in 1910, except that the lift and diameter of the valve will be substituted for the area. The following formula is therefore suggested:—

ASSUMING VALVES HAVE 45-DEG. SEAT.

D — The total of the actual diameters of the inner edge of the seats of valves required.
H — Total heating surface of boiler in sq. ft. (Superheating surface not to be included.)
L — Vertical lift of valve in inches.
P — Absolute boiler pressure in lbs. per sq. in.

$$D = .036 \times \frac{H}{L \times P}$$

EXAMPLE.

$$\frac{036 \times 2878}{.1 \times 200} = 5.2 \text{ in. Diameter}$$

which would require two 3-in. valves.

(3) *Maximum Capacity of Safety Valves.*—The only accurate method of determining the capacity of safety valves is by actual test in a testing plant, with safety valves fully equipped with springs, as in actual road service. In order that it should be positively known that safety valves will prevent undue raise in pressure under extreme conditions, they should be subjected to a road test.

(4) *Number and Size to be Applied.*—Every locomotive should be equipped with not less than two, and not more than three safety valves, the size to be determined as per formula in paragraph 2. Safety valves to be set as follows:

First—Boiler pressure.
Second—Two lbs. in excess.
Third—Three lbs above second, or five lbs in excess of first.

(5) *Metal for Valves and Valve Seats.*—No metal has yet been developed as entirely proof against erosion. Nickel seats and valves are desirable, and an improvement over other metal, but are expensive as to first cost and renewals; therefore, the committee's recommendation is to continue the use of bronze alloys.

(6) *Stamping Lift on Valves.*—Manufacturers should be required to stamp on the valve the lift in inches, as determined by actual test, with valve in working condition, and set for a blow-back of not to exceed 3 lbs. The committee recognizes the fundamental importance of valve lift. It, therefore, recommends that in design and manufacture valve lift receive proper consideration.

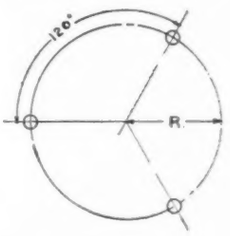
(7) *Estimating Steam Discharge.*—Steam discharge from safety valves of given size can be estimated closely by the use of Napier's rule for flow of steam, as follows:

Flow of steam per second:
Absolute pressure in lbs. per sq. in., multiplied by area in sq. in. of discharge opening, divided by 70.
Multiplied by 3,600 gives flow in lbs. per hour.

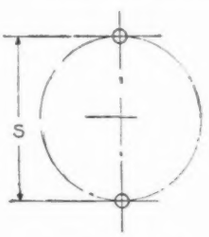
(8) *Location of Valves on Boilers.*—The location of safety valves has much to do with the normal crest of the water in the boiler; therefore, safety valves should be located at the highest point on the boiler, where clearance limits will permit, in vertical position, avoiding the use of piping, long nipples and ells between safety valves and boiler.

VALVE SIZE	SPACING S	RADIUS R
4½"	9"	5 3/16"
4 "	8½"	4 7/8"
3½"	8 "	4 5/8
3"	7¼"	4 3/16
2½"	6½"	3 3/4"

APPLICATIONS MADE AS DESCRIBED PERMIT USE OF WRENCH FITS RECOMENDED & MOVEMENT OF STANDARD WRENCH ONE SIXTH OF A TURN WITH A REASONABLE MARGIN



THREE VALVES



TWO VALVES

Fig. 1—Location of Safety Valves.

(9) *Spacing in Dome.*—Where safety valves are located on an independent dome, they should be spaced as per Fig. 1. The opening from boiler into dome and the area between supporting ribs in dome should not be less than inlet area of valves. If this

is not done, the opening will momentarily reduce pressure, causing valve to flutter and hammer.

(*10*) *Hydrostatic and Other Tests.*—The practice of screwing down the safety valve spring during a hydrostatic test of boiler should be discontinued. Valves with springs designed for certain pressures should not be subjected to extreme pressures. One safety valve should be removed and replaced with a special high-pressure valve, and the other valves should be removed and replaced with caps or plugs during test.

(*11*) *Standard Connections.*—In order to make valves of different manufacture interchangeable, recommend standard thread and diameter of valves at connections as follows:

2½-in. valve	2½-in. U. S. S. pipe thread	8 thds. to in.
3 -in. valve	3 -in. U. S. S. pipe thread	8 thds. to in.
3½-in. valve	3½-in. U. S. S. pipe thread	8 thds. to in.
4 -in. valve	4 -in. U. S. S. pipe thread	8 thds. to in.
4½-in. valve	4½-in. U. S. S. pipe thread	8 thds. to in.

Valves of above sizes to be made for U. S. S. wrench fit.

(*12*) *Inspection of Old Springs.*—As it has been found that the condition of the safety valve springs greatly affects the discharge capacity of the valve, old springs should be tested as to their deflection under load before being used in required valves.

(*13*) *Repairs to Safety Valves.*—Safety valves should be thoroughly overhauled and put in good condition whenever the locomotive is in shop for general repairs. Standard gages should be used in order that important dimensions may be maintained as originally designed. If this is not done, it generally impairs the efficiency of the valves. The committee desire to thank the various manufacturers and members for the assistance rendered.

The report is signed by:—W. J. Tollerton (C. R. I. & P.), chairman; I. B. Thomas (Penna.); W. D. Robb (G. T.) and E. C. Schmidt (Uni. of Ill.).

DISCUSSION.

M. Flannagan (C. & O.): I notice that the committee in this paper recommend that the valves be threaded for pipe tap connection. I assume that it is the intention of the committee that it shall not be necessary to screw them down to a shoulder, in making this fit. It has been my experience sometimes with certain valves, where the seat is close to the threaded portion that the valve would be distorted by some injudicious workman screwing it on too tightly. Personally, I believe we can get better service with a straight thread, and the valve to be screwed down to a shoulder.

Mr. Tollerton: I will say this in regard to the valve connection: the committee investigated the matter, and was surprised to learn there were practically no 2 manufacturers who turned out a standard connection; that is, the threads and diameters used had no standard taps to suit. In deciding on this standard connection, we used the U. S. standard pipe tap. Of course, I presume that the manufacturers in future will make any special shank that is desired by the railway, and our aim was to get a wrench fit of suitable diameter, a standard by which wrenches could be purchased, and to have all valves made of a given diameter, the same size as for the wrench fit.

In investigating the matter the committee found that open pipes and muffled pipes did not have the same wrench fit, so it was necessary for a workman, who was going on top of a locomotive, and having two valves to remove, to carry two wrenches. As far as the straight thread versus the pipe tap screwed to a shoulder is concerned, the latter method may have some advantages, but it has many disadvantages, such as the likelihood of stretching the valve, reducing it, and hammering it makes the application of the nipple necessary each time you unscrew it.

C. D. Young (Penna. Lines West): I did not expect to discuss this paper this morning, and so did not bring with me the notes which I had prepared on the subject of safety valves, but I will endeavor to bring out some of the points which were brought out after I received this report. In paragraph 4, it is recommended that "not more than 3 safety valves" be used. We have made a large number of experiments on safety valves which follow practically the formula given in paragraph 2, and we have never found a condition yet on a boiler where 3 safety valves were needed. I believe that at the present time it is a mistake for the association to recommend 3 safety valves, for the third one is not needed on any of the largest boilers which are built. If the safety valve is designed in accordance with the formula proposed, I do not feel it will ever be necessary to have 3 safety valves in order to properly assure holding the pressure.

If the committee and the association desire 3 valves, I would suggest a change in the setting of the second valve, from 2 lbs. to 3 lbs. It is very difficult to keep 2 safety valves within 2 lbs. of each other, and I believe we will fully answer all the requirements for keeping the second safety valve in operation by a range of 3 lb. pressure between the nominal working pressure and the next pop. If the recommendations of the committee are to be adopted, to have three valves, I would like to see the second valve set at 3 lb. and the third one set at 5 lb.

The committee in paragraph 5 states that "Nickel seats and valves" (and I presume that the entire body of the valve would be included) "are desirable, and an improvement over other metal, but are expensive as to first cost and renewals." I would like to ask the committee for more information on this subject. It is stated here pretty broadly, that the only reason we should not use nickel seats and valves is because they are more expensive in first costs and renewals. Now, if the nickel valve is the right thing, I believe that many more roads would be using them than are doing so at the present time. I will ask the committee, what percentage of the roads which answered the circular, stated they were using as standard on their locomotive, nickel valves and seats? Before approving this recommendation, I would like to receive some information indicating whether or not we would be justified in going to a nickel valve. I do not believe there are many used. Most of the manufacturers are not bringing them around and talking them up, at least those who have had long experience with them.

In paragraph 11, the committee suggests that the U. S. thread be used, with which I agree, but I would suggest inserting in the paragraph after the word "recommend," the words "where valves are threaded." It is necessary on some of the very high boilers to abandon the use of the threaded valve and use a ground ring joint with studs, and I believe we should recognize that is proper construction; and by so modifying this paragraph, it permits the designer to use the ring type of joint with studs and nuts.

Mr. Tollerton: In answer to Mr. Young's question about the nickel seat, I will say that our investigation showed that very few are being used; you will note by reading further on in paragraph 5, that we do not recommend them, but in our investigation as to use of valves, we found there were some nickel seats. The principal difficulty with them is the insertion of the nickel seat in the brass body of the valve. We felt that the average locomotive machinist could not do it successfully, and by adopting the nickel seat we would only have another leak in the pop valve.

As to the question whether we shall have 2 or 3 valves, our investigation developed that there were a great many lines using 3 valves, and they were just as strong for the 3 valves as the other lines were for the 2 valves. We, of course, wanted to make the report broad enough to suit all of the railways. That is the reason we felt there was no reason for making any further recommendation. The variation between the first and third valve is so great now, that practically the third valve will not work at any time, so that we wanted to make the report broad enough, to enable a road to use 2 or 3 valves as it desired. The report does not state that 3 valves are required or needed, but it gives any road the privilege of using 2 or more valves.

Wm. Elmer (Penna. Lines): While it is true that the engineemen have control of the oil fires to a better extent than they do on a coal-burning locomotive where the exhaust causes a very intense combustion, in case of any derangement of the parts or inability of the enginemen to control the oil fires, is it proper to assume that no more than the ordinary provision which is made for the coal-burning locomotive is necessary?

J. F. DeVoy (C. M. & St. P.): It is altogether probable that in any ordinary practice one locomotive pop valve of sufficient size will take care of any steam generated by a boiler, so that it would seem probable that 2 valves were the proper thing, but there has always been a doubt in my mind as to just what defense you could make, in case of a suit at law, based on the explosion of a boiler which had 2 valves. We will assume that there is a possibility of the first valve becoming inoperative through some means. Then the question arises as to whether the second valve, in say, an oil burning locomotive will properly take care of all the steam generated at a quick shut-off of the engine.

In order to properly guard against anything which might be brought up in a case at law, I believe there can be no question raised but what the third valve will take care of any contingency whatever, and the road with which I am connected has always favored the third valve on that account, not because of a probability that it will be called into play, but to absolutely guard against any contingencies which may possibly arise.

In a boiler explosion of any kind, it has been quite definitely determined that it takes from 14 to 20 minutes to lose the water in a boiler where the gage cocks have shown one or two gages of water, a variation of 2 or 3 in., or down to the point where the rupture or explosion takes place, say anywhere from 9 to 14 in. below the top of the crown sheet. Of course, we all realize that there

is only one thing that will cause a boiler explosion, or to cause the crown sheet to drop, or whatever way you want to put it, and that is the loss of water. There has been a doubt in my mind as to whether the additional 2 valves might not give a man in charge of the boiler a minute or two longer in which to save his life, because if he acts at the right time, there is a possibility that he can prevent something occurring. However, I still believe that the report of the committee is about right in allowing a road to use 2 valves if by doing so, it thinks it is properly protecting itself. But in the case of a larger boiler, generating steam much faster, I think it would be just as well to risk the extra $20 and then you know you have done everything it is possible for you do do to protect the men operating the locomotive.

Mr. Tollerton: None of the lines like the Southern Pacific and the Santa Fe, which are large users of oil burners, had in any way changed their number of pop valves as between oil and coal burning engines. On the Rock Island we have a number of oil burning engines, and use the same installation on oil burners as on coal burners.

Referring to paragraph 9, and the chart accompanying it, probably a word of explanation might be due there. We found in making inquiries and investigation, that it is quite frequently the practice to crowd the safety valve into too small an era. We thought it might be desirable to get up a sketch, such as is shown in connection with paragraph 9, which would give the minimum allowance between the valves, and permit the swing of a wrench to tighten or loosen the valves. That is the idea of that sketch.

Mr. DeVoy: I move that the report be accepted and referred to letter ballot, the rejort just as it is.

T. R. Cook (Penna. Lines): Before that motion is put, there is just one point concerning which I should like to hear further from the committee, and that is paragraph 6, which says "Manufacturers should be required to stamp on the valve the lift in inches as determined by actual test." This, I assume, the committee put in, with the understanding that the lift of the valve determines the capacity of the valve. That was not my understanding. I believe there is a considerable difference in the discharge of valves with the same diameter in lift, depending on the design of the valve, both as to the steam passage and as to the contour of the lifting lip, and if any stamping on the valve should be done it should be in pounds of steam per hour, rather than the dimensions of the valves.

Mr. Tollerton: The idea of asking the manufacturers to stamp the lift on the valve was that it might be readily determined, by the formula, as to the valve requirements for a certain size boiler. It has not anything whatever to do, with the discharge of the valve, merely indicates the lift, 1/10 or 1/8, or whatever the amount should be, so that anybody can figure out the safety valves required for a given boiler.

O. C. Cromwell (B. & O.): Referring to paragraph 11, if we want to maintain the standard, we should have standard thread gages for that fit. We find that is necessary, and we furnish the gages to the manufacturer. We have not a very large range. We want a locomotive to take care of your clearances when you are applying safety valves, so in order to keep within the very closest range it is necessary to keep your range up to very close dimensions; therefore we use both a male and a female gage, using the male gage for the safety valve and the other for the spud that is used in connection with it. I should think that should be incorporated in the master mechanics' revised dimensions for these threads.

As regards the sizes made for the wrench fit, the report says: "Valves of above size to be made for U. S. S. wrench fit." I do not know how much larger that is going to be over the present size dimensions generally used. It occurred to me it would be somewhat larger. Our locomotives are very much crowded and the safety valves are in a cramped condition, and if we enlarge the wrench fit over what it is at present, you will have trouble in applying the valve.

Mr. Tollerton: The committee took that up with all the pop valve manufacturers, and wrote them what we proposed to recommend as to the standard connection and standard wrench fit. They all agreed to it and said they were very glad to see the move made. I know cases where this wrench fit exceeded the diameter of the outside of muffle, so that any valve that will come in on any dome or turret, the wrench fit will clear.

As regards the increased size, very little is added to the present manufacturers' wrench size fit, to bring it up to the U. S. standard size. I have got the sizes here, and will be glad to read them, as far as we were able to determine, but the increase is from 1/8 in. to 3/8 in. over the bolts, not more than 1/16 to 3/16 on each side, and in no case did any of the large manufacturers complain about the increase in metal. With the sketches as shown, as I said before, the wrench fit will clear the diameter of the muffle.

C. D. Young (Penna. Lines): I want to refer to the point brought up by Mr. Cook who spoke about the lift of the valves. Mr. Nelson, the engineer of tests, did a great deal of work on the subject of studying the lift of pop valves, and after a number of years of effort, he came to the conclusion, that so far as he was concerned, and the department was concerned, it was impossible to determine accurately the lift of the valve when working. I believe that view of the matter has been confirmed by the Massachusetts Institute of Technology, where they have been doing some work along the same line.

I therefore think that in view of this fact, I think it would be well to change the stamping of the lift, and I would propose the capacity, or some other measure of the valve, as to its size; either by number or capacity in steam be stamped. You can measure the capacity of the valve, and that, it seems to me, is the better measure than the lift of the valve, although I feel that some tolerance in lift should be provided for, so that the manufacturer will not be permitted to say 0.15 lift, or greater, or some other such figure. It seems to me it would be desirable to let this report go back to the committee, in view of the discussion we have had, for further consideration of the subject, and for report next year, and I would make an amendment to the motion of Mr. Devoy to that effect.

Mr. Seley: This is a report which has been before our convention for two years. As I recall it, the formula for the discharge is practically the same as was gotten out by the committee in its report a year ago. Nowithstanding what has been said about the impossibility of measuring the lift, I believe, within broad lines, at least, the litt can be expressed as a comparative measure to discharge the valve. Certain manufacturers in the last few years have brought out a higher lift valve, for instance, than has been the custom in the older designs. Whether these new designs have proven to possess all the merits claimed for them by the manufacturers, I do not care to discuss, I do not know; but in any event, the broad field between the high lift and the old lift is sufficient, I think, to carry out what the committee have in mind, and the manufacturers who were consulted on this matter, as I understand it, comprise all of the important ones, and as the matter contained in the report has their approval, I would say that it seems consistent to carry out the recommendation of the committee. I would therefore second Mr. DeVoy's motion without the amendment.

T. Rumney (C. R. I. & P.): Would it not be possible to add to the life of the valve in inches, as recommended by the committee, the discharge of the valve, and that would cover Mr. Young's point, and also take care of the committee's recommendation. To me it would seem too bad to lay the report over another year after the committee has had it under consideration for two years.

Mr DeVoy: I do not know of any other way to measure the discharge of a valve except by measuring the annular opening of the lift of that valve. I understand Mr. Young's point perfectly; it was all right; but you must know the life of the valve before you can know the discharge. The lift of the valve must properly take care of the discharge, or you cannot in any manner figure the discharge of the valve, and so far as I have any knowledge, the discharge of the valve is properly taken care of by the lift, and cannot be taken care of in any other way. Mr. Young shakes his head; but I know, so far as I am concerned, that it does take care of the discharge of the valve, and if you will refer back to your mathematics, you will find out that is the proper way to do it.

Mr. Tollerton: We tried in making up this report to get the last word on the safety valve question. I quite agree with the suggestion of Mr. Rumney in regard to the discharge, and I think the committee will, but it is of vital importance that the lift be stamped on the valves. Valves of the same diameter with different lifts will have different discharges. We have tried it and we know it, and therefore the lift increases in importance. I personally cannot see any objection to it. It should be on the valve. If you want anything else on the valve for further information, the committee will be pleased to make a recommendation to that effect.

Mr. Young: If the committee will accept Mr. Rumney's suggestion and the suggestion I offered on paragraph 5, striking out the reference to nickel seats and valves, I will withdraw my amendment to Mr. DeVoy's motion.

Mr. Tollerton: As a matter of harmony the committee has no objection to accepting it, but I think paragraph 5 should not be taken out for the reason that it will show in the proceedings that the question of nickel seats has been looked into. We could not find where nickel seats were recommended by any manufacturers or were in use

on any number of railways, but we might start some investigations later in that direction.

Mr. Young: I want to read what the committee said in that connection: "Nickel seats and valves are desirable and an improvement over other metal but are expensive as to first costs and renewals." What does that mean? It means, inferentially that the committee would recommend these nickel seats and valves, but that they are too expensive as to first costs and renewals.

Mr. Tollerton: Read the last portion of the paragraph where we recommend the use of bronze alloys.

Mr. Young: You make the broad statement that nickel seats and valves are desirable and an improvement over other metal, but the reason you do not recommend them is because they are expensive as to first cost and renewals. That is a broad statement, to say that nickel seats and valves are desirable, and do not recommend them because they are expensive, and then recommend something cheaper. I do not think we know enough about nickel seats and valves to pass any opinion upon them, no one, to my mind, is using them successfully, and I should think that statement should be carried out.

Mr. Seley: I think that the object of the committee in putting this into the report, as the chairman of the committee has said, is to indicate that the whole matter has been considered. The matter of objection to nickel seats has been fully covered in the discussion. Anyone who receives a copy of our proceedings, and is interested in this subject, as a natural supposition, reads the discussion as well as the paper, and I think we would limit rather than broaden the question if we excluded information as given to us by the committee and as developed in discussion.

Mr. Rumney: The paragraph might be changed to read as follows: "Nickel seats and valves, although providing an improved lift, are undesirable because of first cost, cost of repairs, and the difficulty of their application; therefore the recommendation of your committee is to continue the use of bronze alloys." Would that meet your ideas, Mr. Young?

Mr. Young: I would second such a change, if the committee will accept it.

The Vice-President: Will Mr. Tollerton accept that change in the report?

Mr. Tollerton: Yes.

With that amendment, Mr. DeVoy's motion was passed.

A CORRECTION.

An error was made in the article entitled "The Chilled Iron Car Wheel," published in the first issue of *The Daily*. It was stated that if the cost of a 625-lb. wheel were based on an average life of 12 years this would make the cost of the wheels under a car approximately $2.33 per day. The statement should have been that this would be approximately the cost per year.

M. M. HONORARY MEMBERSHIPS.

During the convention yesterday the following members, whose applications had been approved by the executive committee, were elected honorary members of the M. M. Association: George E. Branch (member since 1894); H. Tandy (member since 1883); J. S. Turner (member since 1887); Thomas Walsh (member since 1874); Charles A. Thompson (member since 1890); W. A. Brown (member since 1891).

FIRE ON THE PIER.

The services of the pier firemen was called into play Saturday morning in the power plant at the entrance to Machinery Hall. On starting up the air compressor, the motor driving it demanded more current than the primary circuit could carry. This overheated the main fuse which refused to blow. As a result, a few sparks flew and the smell of burning insulation brought a fireman with his extinguisher. Needless to say, however, his efforts were fruitless until the attending electrician came to the rescue by pulling the switches. A repetition of the fireworks has been guarded against by W. W. Paxson, the chief electrician of the pier, who has had oil switches installed.

HISTORY OF THE BARNEY & SMITH CAR COMPANY.

The growth of large manufacturing industries is always an inspiring study, especially those which were pioneers in their districts. The Barney & Smith Car Company, of Dayton, Ohio, was established in 1849 when Dayton was a town with 10,000 inhabitants and had no railway connection. The history of the company, which has recently been published, well illustrates the results that follow the honest and conscientious work of a few strong, able men building on a firm foundation. When the works were established by Eliam E. Barney and Ebenezer Thresher, the product was loaded on canal coats and taken down the Ohio River to the nearest rail connection. Now, however, Dayton is a city of 125,000 people, and has numerous steam and electric railway connections. The book is given up quite largely to a personal history of the officers and accounts of the various reorganizations which marked the development of the company from a capital of $10,000 to $4,500,000.

A very impressive table is included that gives a list of the employees who have been continuously in the service of the company for over twenty years. This gives the names of 182 men, of which 41 have served over 40 years. In the latter part of the book is included a history of each department giving the names of the various foremen and their lengths of service.

SUPERHEATERS AND SWITCH ENGINES.

One of the most interesting developments in the progress of superheater locomotives during the past year has been the successful application of the superheater to switch engines. It had been quite generally considered that switch engines did not offer the best opportunity for obtaining the highest efficiency from the superheater. This was based on the conditions under which the switch engine operates. It only works steam a comparatively small percentage of the time that it is in service, and then only during short intervals. The actual experience with superheaters in switching service has shown that the resulting economies have been even greater than those obtained with road engines equipped wi h superheaters.

It is well known that saturated steam switch engines operating under ordinary conditions have a marked tendency to work water out of the exhaust and that they suffer heavy losses from cylinder condensation. These losses not infrequently attain the magnitude of from 40 per cent. to 45 per cent. of the total water evaporated and it is necessary to use extra coal to evaporate the additional water. The use of highly superheated steam in switching service has entirely eliminated these losses and effected a corresponding saving in coal and water.

Under ordinary switching service conditions, where saturated engines are employed, there is a considerable loss of time of the switching crew while the engine is taking supplies, particularly water. During this time the crew is standing idle. Inasmuch as it is not necessary to take water so frequently with the superheater engines in switching service this time is available for the purpose of doing actual work.

In addition, it has been found by experience that switch engines equipped with superheaters furnishing highly superheated steam operate with a remarkable reduction in smoke. This is of considerable importance, especially in passenger terminals in large cities where the smoke nuisance ordinances are strictly enforced. The fact that superheater switch engines do operate with a minimum of smoke is explained by the fact that the saving in water makes it possible to do the same work with a correspondingly less amount of coal. It is, therefore, not necessary to fire so heavily, and more attention may be given to the practice of the proper methods of firing.

Finally, the use of highly superheated steam in switching service produces a smarter engine, thus making it possible to

do the same amount of work in less time or considerably more work in the same time. It is often desirable, especially in connection with the present-day high-speed passenger service, to make switching movements at a very rapid rate and the increased flexibility of the superheater switch engine is a valuable adjunct.

A RECORD LOCOMOTIVE PERFORMANCE.

A single locomotive of the 2-8-2 type recently handled a train of 112 cars weighing 7,590 tons over a division with an 8-mile ruling grade of .2 per cent., at an average speed of 15½ miles per hour, running time. An average speed of 9½ miles per hour was recorded on the hill. This is the latest of the record performances of the trial Mikado type locomotive, built last year for the Chesapeake & Ohio by the American Locomotive Company. This locomotive was illustrated and described in the Feb. 2 issue of the RAILWAY AGE GAZETTE and the March issue of the *American Engineer*.

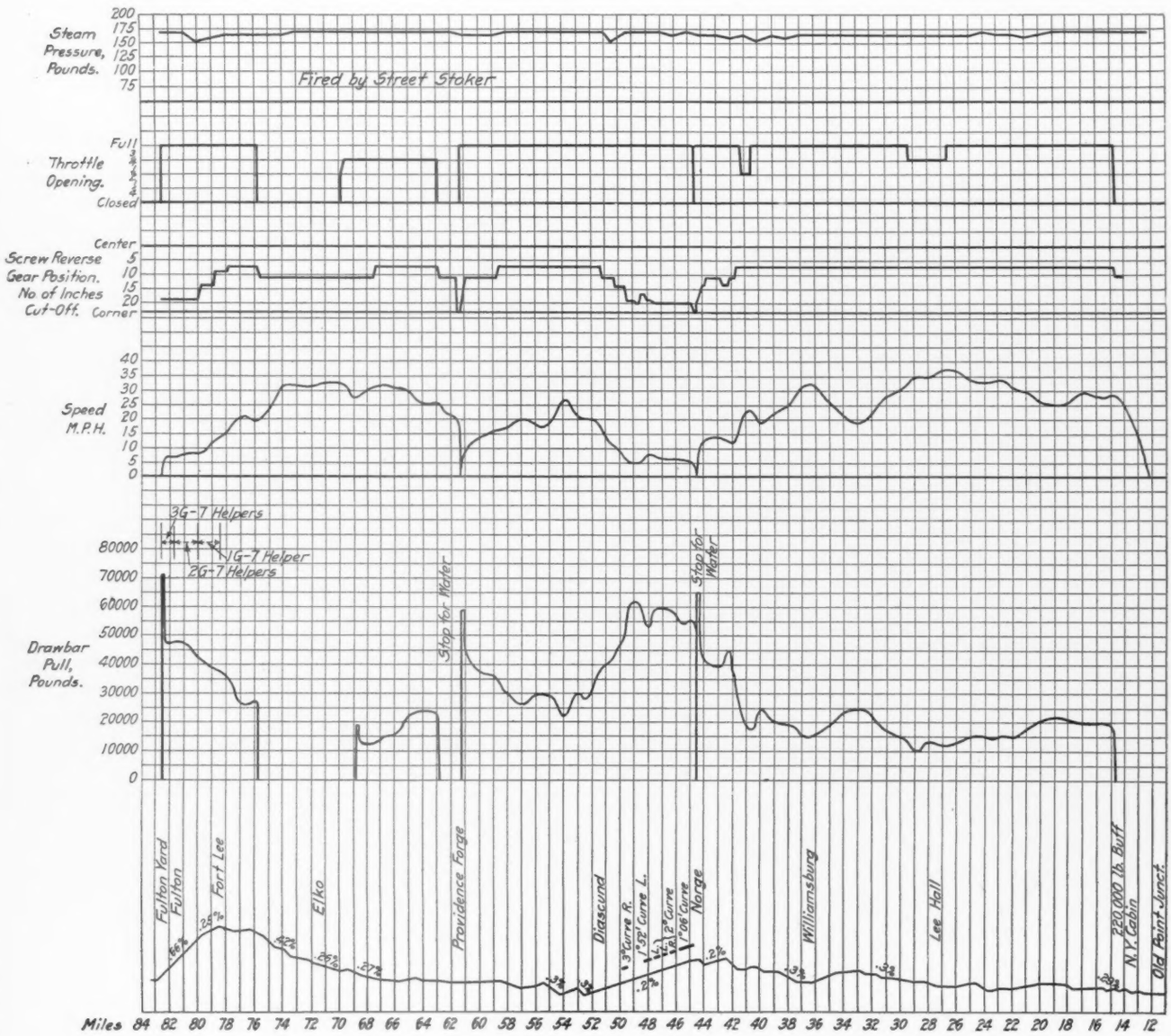
The above feat in itself, apart from the other circumstances of the run, is proof that this locomotive is the most powerful of its type. The real power of the locomotive, however, is possibly best shown by the remarkable hauling capacity developed by it at the higher speeds.

Exceptionally high drawbar pull, maintained mile after mile at speeds ranging from 25 to 30 miles per hour, are shown by the dynamometer record given herewith. A few typical consecutive records taken from the dynamometer charts of this and other runs in the series of tests are shown in the table below:

Mile Post.	Drawbar Pull (Pounds) Run No. 47.	Speed M. P. H.	Mile Post.	Drawbar Pull (Pounds) Run No. 53.	Speed M. P. H.
53½	25,000	28	54½	28,000	23
53	32,000	23	54	23,000	27
52½	27,000	24	53½	25,000	25
52	33,000	24	53	30,000	21
51½	36,000	20			

These figures have an important and very timely significance. They show the enormous power which can be obtained by careful design with a weight of approximately 60,000 lbs. per driving axle and in a type of locomotive well adapted to all around road freight service. This Mikado, weighing with its tender only 47 per cent. more than the Chesapeake & Ohio standard consolidation, can haul 77 per cent. more tonnage in 80.5 per cent. more cars at practically the same speeds. This striking fact is shown by comparison between the run cited above and the best record of the consolidation over the same division made in the same tests.

The record load for the consolidation was 4,246 tons. With this train, an average speed of 17 miles per hour running time over the division was made. The consolidation and tender with



Record of One Mikado Locomotive With a Train of 112 Car s, Weighing 7590 Tons.

full load of coal and water weigh 329,000 lbs., as compared with 484,700 lbs., the weight of the Mikado and its tender.

By reducing this comparison of the performance of the two classes of locomotives to terms of hauling capacity at the same speeds per pound of locomotive weight, the much higher efficiency of the Mikado is still better indicated. The consolidation hauled .0129 tons for every pound of its maximum weight including tender, and the Mikado, .0156 tons, or 21 per cent. more. The maximum record of this locomotive is 27,000 lbs. drawbar pull at 33 miles per hour. This is equivalent to a drawbar horsepower of 2,378 or one horsepower at the drawbar for every 132 lbs. weight of locomotive.

In the two runs, noted in the above table, the best record shown is 33,000 lbs. pull at 24 miles per hour made in run No. 47. This is equivalent to a drawbar horsepower of 2,110. This pull was developed at mile post 52, which is on a .2 per cent. grade. Consequently, by conservative estimate, the above horsepower at the drawbar means at least 2,385 I. H. P.

Run No. 47 also shows the highest sustained drawbar horsepower. Between mile post 53½ and 51½ the locomotive developed an average drawbar pull of 31,833 lbs., at an average speed of 23 miles per hour. This is equivalent to 1,901 drawbar horsepower.

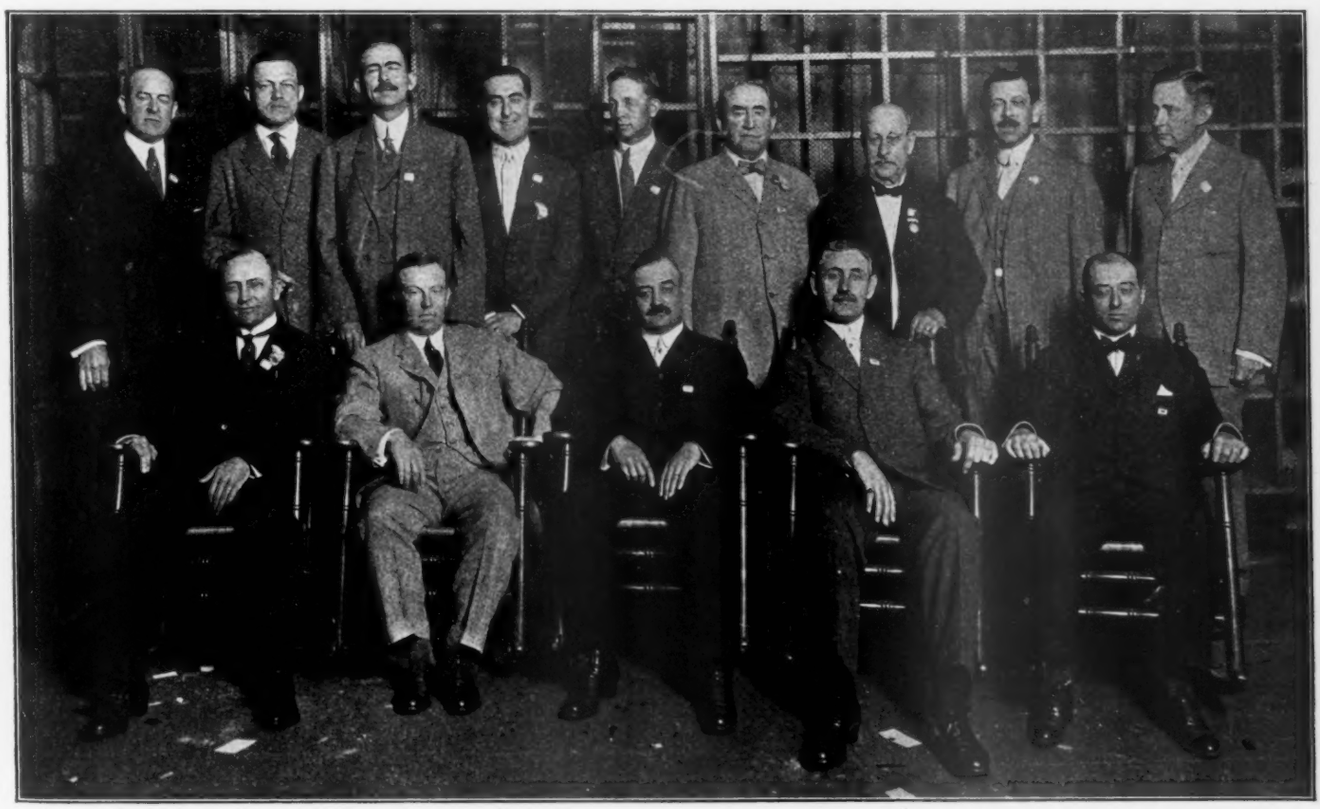
These figures, while interesting in themselves, have a particular significance. They show that in the big locomotive, carefully and properly designed, a greater percentage of increased power is secured for every percentage of increase in weight.

The full record of the run mentioned in the opening paragraph is given in the condensed dynamometer chart. This run was one of a series of tests which the Chesapeake & Ohio has been making to determine the maximum tonnage ratings for its various classes of locomotives. These tests were made with the Westinghouse Company's dynamometer car. On run No. 47, already referred to, the Mikado hauled a train of 102 cars weighing 7,045 tons. On the other runs, it hauled respectively a train of 98 cars of 6,767 tons aggregate weight and one of 100 cars of 6,905 tons.

It is interesting to note the performance of the Mikado with 7,590 tons on the 8-mile grade, at the top of which a stop was made for water. The average speed up the grade was 9.5 miles per hour, based on the speeds recorded at each half mile. For the last four miles, when the run developed into a steady drag, the locomotive developed a sustained drawbar pull of 57,750 lbs. at a practically uniform speed of 6½ miles per hour. Conservatively estimating the locomotive and tender resistance, this means that it maintained a tractive effort of 1,000 lbs. in excess of its maximum rated power based on 85 per cent. of the boiler pressure of 175 lbs. This indicates an unusually high mean effective pressure at maximum cut-off. It is undoubtedly attributable to the use of superheated steam, and in some degree, at least, to the more direct steam passages of the arrangement of outside steam pipes employed.

Starting this 7,590-ton train after taking water at the top of the .2 per cent. grade with the greater proportion of it on the grade is another record feat of the locomotive on this run. A drawbar pull in excess of the theoretical maximum tractive effort was developed at this point. It is particularly evident from the complete records that the locomotive has a large margin of capacity sufficient to maintain its full maximum rated power for protracted periods and to exceed this for short periods or at critical points.

Preliminary surveys have been completed for the railway from Bhamo, China, to Tengyueh, 123 miles. The gage will be either 2 ft. 6 in. or 3 ft. 1 in.



SUPPLY ASSOCIATION EXECUTIVE COMMITTEE.

Top row, left to right: Messrs. Johnson, Storrs, Morton, Brown, Blakeslee, Riley, Adreon, Ashton and Lanahan. Bottom row, left to right: Messrs. Walker, Allen (vice-president), Stafford (president), Conway (secretary), and Lord (treasurer).

M. M. REGISTRATION.

Abbott, A. S., Mech. Supt., St. Louis & San Francisco R. R., Haddon Hall.
Allan, Arthur, M. M., Temiskaming & No. Ontario Ry., Marlborough-Blenheim.
Anthony, F. S., S. M., Tex. & Pac. Ry., Traymore.
Appler, A. B., M. E., Delaware & Hudson Co., Marlborough-Blenheim.
Arden, D. D., M. M., Savannah & Statesboro Ry., Lexington.
Arp, W. C., S. M. P., Vandalia R. R., Marlborough-Blenheim.
Atkinson, R., Baldwin Loco. Works, 22 Tenn. Ave.
Ayers, A. R., G. M. E., N. Y. Cen. Lines, Marlborough-Blenheim.
Baker, Geo. H., Railway Educational Assn., Dennis.
Barnum, M. K., G. S. M., Ill. Cent. R. R., Dennis.
Bayley, J. J., M. M., Southern Ry., Channell.
Beau, S. L., M. S. Supt., A. T. & S. F. Ry., Marlborough-Blenheim.
Becker, E., M. M., C. & N. W. Ry., Schlitz.
Bell, R. W., Supt. Mach., Ill. Cent. R. R., Dennis.
Benett, W. H., M. M., Penna. R. R., Traymore.
Bingaman, C. A., E. of T., Phila. & Reading R. R., Monticello.
Bingley, W. J., M. M., Western Maryland Ry., Monticello.
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Blunt, James G., Supt. Genl. Drawing Room, Amer. Loco. Co., Traymore.
Booth, J. K., Gen. Foreman, Bessemer & Lake Erie R. R., Traymore.
Bowles, C. K., M. M., Tidewater & Western R. R. Co., Channell.
Boyden, N. N., M. M., Southern Ry., Shelburne.
Bradley, W. H., M. M., C. & N. W. Ry., Marlborough-Blenheim.
Brandt, C. A., M. E., C. C. C. & St. L. Ry., Marlborough-Blenheim.
Bruck, H. T., S. M. P., Cumb. & Penn. R. R.
Burns, Jno., M. M., Canadian Pacific Ry., Haddon Hall.
Butler, W. S., M. M., Chesapeake & Ohio Ry., Haddon Hall.
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Chenoweth, E. G., M. E., Erie R. R., Strand.
Chidley, Jos., M. M., L. S. & M. S. Ry., Traymore.
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Cockfield, Wm., Loco. Supt., Peruvian Southern Ry., Young's.
Cook, Thos. R., A. E. M. P., Penna. Lines West, Brighton.
Crawford, D. F., G. S. M. P., Penna. Lines West, Brighton.
Crownover, G. M., M. M., C. G. W. Ry., Lexington.
Brighton.
Davey, Thos. S., M. M., N. Y. S. & W., Schlitz.
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Gill, John, Young's.
Gillis, H. A., M. E., Seaside.
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Harris, E. J., M. M., C. R. I. & P., Grand Atlantic.
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Hill, Rufus, Retired M. M., Pa.
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Smith, P. F., Jr., S. M. P., P. R. R. Co., Brighton.
Smith, Willard A., Dennis
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Stocks, W. H., Dennis.
Strauss, M. H., M. M., N. Y. C. & H. R. R. R.
Stuart, Charles M., M. M., P. & R. R. R., Pennhurst.
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Watson, R. B., E. of T., Erie R. R., Traymore.
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Wightman, D. A., Dennis.
Wildin, G. W., M. S., N. Y. N. H. & H. R. R., Chalfonte.
Williams, W. H., M. M., B., R. & P. R. R.
Young, C. B., M. E., C., B. & Q. R. R., Traymore.

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Baker, Horace, Gen'l Mgr., C. N. O. & T. P. Ry. A. G. S. R. R., Private Car.
Baker, W. P., C. N. O. & T. P. Ry., Private Car.
Beall, J. W., Insp. Shops, B. & O.
Bennett, R. G., Rodman, Penna. R. R., Haddon Hall.
Beyer, W. F., Foreman, P. R. R.
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Boyden, J. A., M. M., Erie R. R., Chalfonte.
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Clouser, Irvin, Air Brake Insp., P. R. R. R., Miller's Cottage.
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Conneely, Emmett K., Pur. Agt., P. & L. E., Brighton.
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Cowgill, C. P., Draftsman Office G. S. M. P., Penna., Dennis.
Cyr, J. W., S. M. P., C. B. & O., Traymore.
Dale, C. E., Chf. Clerk Purchasing Agent, Panama Commission, Seaside.
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Dice, A. T., Gen. Mgr.
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Doolittle, R. L., S. M. P., S. B. & A., Young's.
Ewing, C. H., Supt., Atlantic City Ry., P. & R. Ry.
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Flynn, H., Aair Brake Insp., D. & H., Arlington.
Frazer, Wm. H., Clerk Pur. Agt., P. R. R., Traymore.
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Jones, Harry W., Foreman, P. R. R., Elberon.
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Robinson, W. L., R. F. of E., B. & O., New Chatham.
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FOREIGN RAILWAY NOTES.

The French railway interests in Indo-China are reaching out in all directions for the development of their system. It has been announced in the press of the Far East that the Siamese government has definitely decided to build the connection between its own lines and the French lines into Saigon, as well as to the south, connecting with Singapore, Malay States, by means of a French loan. This, of course, means the further extension of China's railway connections through the Yunnan Railway. Owing to the fact that this French line to Yunnan ends in a sort of cul-de-sac, it has not been profitable, and a concession which will enable the French interests to open up additional country to feed their line is urgently asked.

The French interests in China have proposed a connection between the Yunnan line and Nanning to connect with the Wuchow-Nanning line. The Chinese authorities have so far refused a concession to foreign interests and are working on the proposition themselves. The board of communications through local authorities plans a line from Nanning to connect with the Yunnan line at Mengtsze. Surveys for this line are being made. The route will be about 400 miles long and reports seem to indicate that the proposed route is by Kaihwa and Kuangnan and thence down the river valley to Nanning. While the route presents no great difficulties, apparently, the road is likely to be expensive. No provision for the necessary capital has so far been made.

ROAD TESTS OF MALLET AND CONSOLIDATION LOCOMOTIVES.

The Carolina, Clinchfield & Ohio has had ten Mallet compound locomotives in service for about two years, and fifteen simple consolidated locomotives for about three years. Both of these types of locomotives were built by the Baldwin Locomotive Works. Road tests of the Mallets were made in October, 1910, and February, 1912. The consolidated locomotives were tested under practically the same conditions, in May, 1912. The average results of the tests and the principal dimensions of the two types of locomotives are given in the accompanying tables.

PRINCIPAL DIMENSIONS AND DATA OF LOCOMOTIVES TESTED.

Wheel arrangement	2-6-6-2	2-8-0
Weight on drivers, lbs.	325,850	178,650
Total weight of engine, lbs.	378,650	199,150
Total weight of engine & tender, lbs.	550,000	350,000
Diameter of cylinders	24 & 37	22
Stroke, in.	32	32
Steam pressure, lbs.	200	200
Diameter of driving wheels, in.	57	54
Tractive effort (M. E. P. = 85% boiler pressure), lbs.	77,400	49,000
Boiler diameter, 1st ring, in.	87	77
Tubes, number and size, in.	448-2¼	412-2
Tubes, length, ft. and in.	21.0	15.3
Grate area, sq. ft.	78	54
Heating surface, sq. ft.	5,752	3,482
Size of exhaust nozzle, in.	5¾	5½

The Mallet locomotives are equipped with Baldwin's reheaters in the smoke boxes. Both engines were hand fired and neither had a brick arch. The tests were conducted from Kingsport, Tenn., south to Soldier, a distance of 22 miles, on a continuous 0.50 grade, compensated for all curves, the compensation being such that tests with a dynamometer car have shown no increase in the train resistance due to the curves. These conditions make this section one of the very best on which to make comparative tests of locomotives, as the engines can be worked at their maximum capacity for the entire trip, and any number of readings and observations may be made under the same working conditions.

The coal used on all the tests was from the same mine, and the analyses, which are given herewith, show the quality to be the same. The coal was carefully weighed and sacked, and was dumped only as needed by the fireman.

	Oct., 1910	Feb., 1911	May, 1912
Moisture	1.04	1.00	1.10
Volatile matter	32.94	31.13	34.94
Fixed carbon	56.07	55.93	53.68
Ash	9.95	11.94	10.28
Sulphur	.81	1.14	.64
B. T. U.	13,830	13,743	13,736

The tank and boiler were carefully calibrated, and readings to determine the amount of water used were taken under the same conditions each time. It should be remembered, in comparing these tests with those of other roads, that in this case the engines were worked at their maximum capacity throughout the tests.

RESULTS OF TESTS.

Columns No. 1 and 2 are average of two trips.
Column No. 3 is the average of three trips.

	Col. No. 1.	Col. No. 2.	Col. No. 3.
Locomotive class	2-6-6-2	2-6-6-2	2-8-00
Date of tests	Oct., 1910	Feb., 1911	May, 1912
Grade, compensated for curvature	0.5%	0.5%	0.5%
Weather conditions	Fair	Good	Good
Condition of rail	Dry	Dry	Dry
Length of route, miles	17½	22	22
Time consumed, total	3 hrs. 6½ min.	2 hrs. 40 min.	2 hrs. 43 min.
Number of stops	2	2	2
Total time delayed at stops.	33½ min.	38 min.	27 min.
Actual running time	2 hrs. 33 min.	2 hrs. 2½ min.	2 hrs. 15 min.
Number of cars in train, including cab	67	51	35
Tons behind tender	4,437	3,513	2,402
Ton-miles of train load	77,386	77,297	52,851
Time throttle was open	2 hrs. 33 min.	2 hrs. 2¼ min.	2 hrs. 15 min.
Average position of throttle.	Full	Full	Full
Total pounds coal burned	14,800	15,550	
Total pounds water supplied boiler	101,629	95,090	12,100 87,388
Average indicated horse-power	1,472.2	.....	1,031

Average initial pressure in cyl.	H. P. 196	.....	188
Average point of cut-off.....	H. P. .755	.....	.56
Average revolutions per min.	45.5	.....	66.2
Average boiler pressure, lbs..	198.4	195	196
Average speed, miles per hour	6.75	5,377	9.78
Maximum speed, miles per hour	9.95	10.8	46,550
Coal burned per hour, lbs...	5,811		
Coal burned per sq. ft. grate area per hour.....	5,825	99.5	12.95
Coal burned per sq. ft. heating surface per hour.....	74.7	1.54	7,630
Water supplied boiler per hour, lbs.	1.02	38,708	97.9
Water supplied boiler per sq. ft. heating sur. per hr....	39,867		1.32
Coal burned per I. H. P. hour, lbs.	6.92	8.1	11.10
Water supplied boiler per I. H. P. hour, lbs.....	3.97	.....	5.21
Water evaporated per lb. coal	27.1	.....	37.7
Equiv. evaporation from and at 212° per lb. of coal....	6.85	6.1	7.28
Average temperature f e ed water	8.36	7.52	8.82
Average temperature atmosphere	50.5°	43.5°	66°
Coal burned per 1,000 ton-miles of train load, lbs....	48°	38°	75°
Water supplied boiler per 1,000 ton-miles of train load	198	202	229
	1,350	1,230	1,653

It is interesting to note that while the tons behind the tender were 85 per cent. more for the Mallet, the coal burned per train mile was only 55 per cent. more, and in some of the individual trip the coal used was only 38 per cent. more for an increase of 82 per cent in the tons behind the tender for the same distance.

While these tests show in favor of the Mallet it is thought that the difference is not as great as it should be, on account of the Mallets having been in service only a comparatively short time when the tests were made. Also the men have become better educated in the handling of these engines, one result of which is that the engines are now run with a larger exhaust nozzle than formerly and burn less coal. This assumption is borne out by the fact that there has been a considerable reduction in the fuel consumption, for the same amount of freight handled, since the tests of the Mallet engines were made. It is intended to make another series of tests on the Mallets in the near future, which will not only give a comparison between the Mallets and the consolidation, but will also show the improvement in the service of the Mallets since they were received.

The Mallets have been used in road service since they were built, and it is largely due to this fact that the road has been able to show a very low operating ratio. Since these engines were built there have been considerable developments in the Mallets, especially in the application of superheaters and stokers, and it is very probable that future engines for heavy freight service on this road will be of this type, equipped with all latest improvements. The tests were conducted by W. S. Moseley, chief draftsman, under the general supervison of H. F. Staley, master mechanic.

The Prussian Landtag has under consideration a memorandum containing comprehensive proposals for electrifying and improving the Berlin city and suburban railways in order to render them capable of dealing with the increasing traffic. With this object in view it is proposed to set up two electric generating stations, one in a lignite district, probably near Bitterfield, and the other near Berlin, the latter as a reserve station, and to supplement the other during the heaviest periods of traffic. The work will involve the laying underground of six pairs of cables of 60,000v. tension. The total cost of the work, which will take about four and one half years to carry out, is put at $30,000,000, of which $12,000,000 is for right of way, construction work, etc., and the remainder for the provision and alteration of rolling stock. It will be necessary to provide 557 electric locomotives and 690 passenger coaches.

Conventionalities.

Langdon B. Valentine, of Valentine & Company, is attending the convention for the first time.

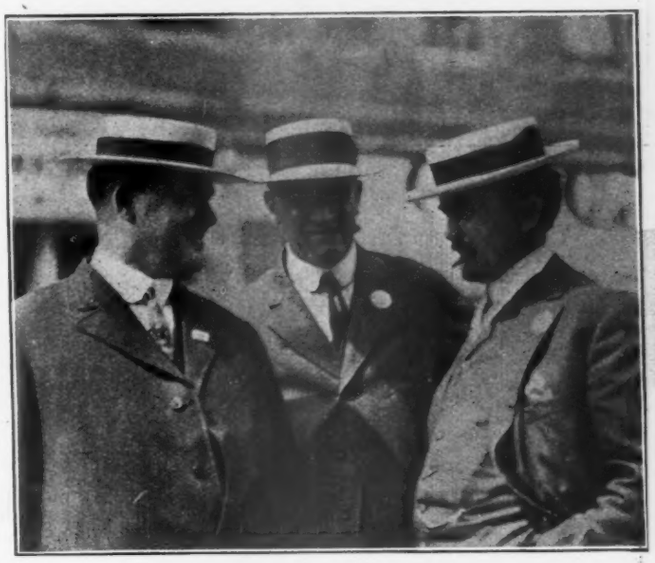
Joseph S. Ralston, president of the Ralston Steel Car Company, reached Atlantic City Friday and registered at the Chelsea.

F. W. Miller, president of the F. W. Miller Heating Company, is attending the M. M. convention and is stopping at the Dennis.

R. L. Mason was parading on the Boardwalk with a pick and shovel when the camera man caught him. Ask him for a copy of the result.

Blue Sundays may be disagreeable; but the best argument for them lies in the apparent ginger everyone possessed the following day.

J. W. Cyr, superintendent of motive power of the Chicago, Burlington & Quincy, took part in the opening proceedings of the M. M. convention Monday morning. Mr. Cyr is a guest of the Traymore.



PARKS TELLING A GOOD STORY.

Left to right—B. A. Keeler, Henry LaRue, Master Car Builder, C. R. I. & P.; O. J. Parks, General Car Inspector, Pennsylvania Liner.

C. A. Dunkelberg, treasurer of S. F. Bowser & Company, has just recovered from an attack of tonsilitis, induced by the spell of damp air of last week.

J. T. Carroll is again in attendance with added powers. He was appointed assistant general superintendent of motive power of the Baltimore & Ohio in February last.

Yesterday afternoon Chairman Ostby of the enrollment committee was presented with a 20-in. pigskin traveling bag and a folding cane by the members of his committee.

B. D. Lockwood, assistant chief engineer of the Pressed Steel Car Company, is here again this year. He was for several years mechanical engineer of the Big Four under Mr. Garstang.

Mr. and Mrs. Horace Baker, son and daughter, arrived from Cincinnati Sunday afternoon in Mr. Baker's private car. Mr. Baker is general manager of the Queen & Crescent and Alabama Great Southern.

The executive committee of the Railway Supply Manufacturers' Association will be glad to know that the "Information Bureau" has been buried at sea with appropriate ceremonies. *Requiescat in pace.*

M. J. McCarthy, assistant superintendent of motive power of the Big Four, is receiving the congratulations of his friends

L. C. Fritch.

on his improved appearance and the very successful result of an operation performed last winter.

Al. Burkhard, general foreman of the car department of the New York Central & Hudson River at West Albany, N. Y., is among the special guests at the convention. He arrived Saturday morning, accompanied by his 7-year-old son, Henry.

The Two Prossers—Tom and C. S.

Mr. and Mrs. J. W. Bettendorf are quartered at the Marlborough-Blenheim. They arrived from Davenport, Iowa, last week and were accompanied by Mr. Bettendorf's father and mother, Mr. and Mrs. M. Bettendorf.

Charles D. Jenks, vice-president of Edwin S. Woods & Company, is registered at the Dennis. Mr. Jenks is accompanied by his bride, formerly Miss Marion Somers, of Chicago. The wedding took place in Chicago on June 4.

A. M. Darlow, mechanical engineer of the Buffalo & Susquehanna, who arrived on Sunday, occupies the unique position of being general storekeeper also. This responsibility has been placed upon him within the past few months.

To his many friends in Atlantic City, George N. Van Sweringen is painting, in eloquent words (we might almost say in moving pictures), the many beautiful things in nature observed on the Pacific coast. Ask him particularly about California.

D. F. Crawford, general superintendent of motive power of the Pennsylvania Lines West, who was compelled to miss the M. C. B. convention, returned Monday in time to act as presiding officer of the M. M. association in President Bentley's absence.

Williard Doud, shop engineer of the Illinois Central, arrived on Sunday morning. An important inspection trip pre-

H. C. Eich, Master Mechanic of the Illinois Central, with Frank Gilmore Telling a Story and M. C. Beymer Looking on.

vented his getting here in time for the M. C. B. meetings. He reports good progress in the work of electrification at the Burnside shops.

The Sherwin-Williams party this year consists of W. B. Albright, director; E. M. Richardson, director; Thomas Madill, manager of the Western railway department; F. M. Elmquist and L. C. Graves. They are quartered at the Marlborough-Blenheim.

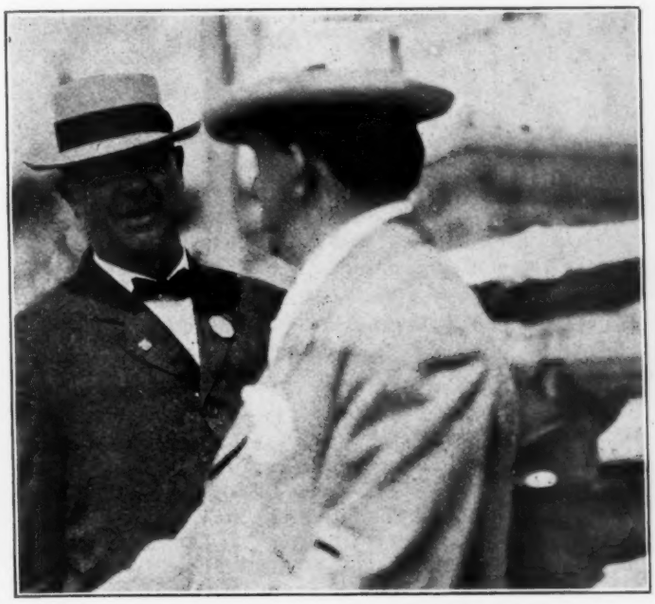
J. F. Pendergast, for 10 years master mechanic of the Baltimore & Ohio at Glenwood, Pa., now master mechanic of the East Broad Top Railroad & Coal Company at Orbisonia, Pa., is taking an active part in the meetings. He is also much interested in the exhibits.

Harry Keller, of the Duntley Pneumatic Tool Company, feels the responsibility suddenly thrust upon him; for on account of important business matters, neither John W. Duntley nor Julius Keller will be able to carry out their plans to attend the conventions this year.

H. S. Demarest, with his family, leaves for Europe about the first of July to be gone until the first of November. They will make an extended tour of several countries. In the

absence of Mr. Demarest, F. E. Ransley and L. J. Van de Wall are here in the interest of Greene, Tweed & Co.

H. B. McFarland, engineer of tests of the Atchison, Topeka & Santa Fe, has a new dynamometer car with a capacity of 1,000,000 pounds, which was put in service a few months ago. He reports that it is proving most valuable for tonnage rating work on the very severe grades in the mountains.



Wells Harris, of the New Haven, Trying to Understand Frank Gilmore's Joke.

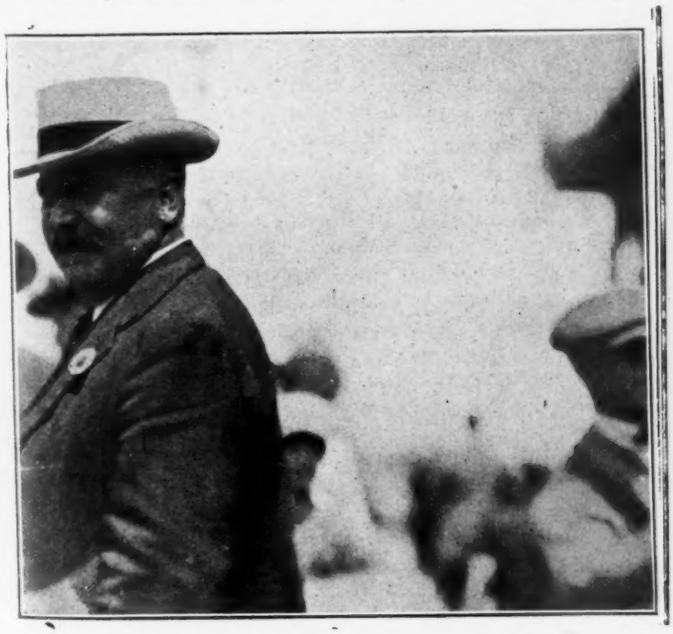
H. F. Wardwell, assistant manager of the Central Locomotive & Car Company, is here for the Master Mechanics' convention and is staying at the Traymore. Last year Mr. Wardwell attended as superintendent of motive power of the Chicago & Western Indiana. Mrs. Wardwell was unable to accompany him here this year.

Secretary Conway disclaims all responsibility for setting up the "Information Bureau" on the beach. We understand, however, that the "bureau" was dispossessed from the pier for non-payment of dues. Early risers yesterday morning sighted a fishing smack just off the pier, in the bow of which the "Information Bureau" was resting easily.

D. E. Fitzgerald, assistant superintendent of motive power of the Frisco, has succeeded in finding time to attend the convention this year. His oldest son, who is attending St. Mary's College at Topeka, Kan., is an enthusiastic baseball fan and asked his father to be sure and send him a copy of *The Daily* containing the account of Saturday's game.

George Carson, District Master Car Builder, New York Central.

Lewis D. Freeman, connected with the mechanical engineer's office on the Baltimore & Ohio, came up from Baltimore for a day or two. *American Engineer* readers will recall him as the author of the article on "Design of Formers for Hydraulic Press" which appeared in the May issue and was one of the very few articles which have ever been published on this subject in any technical paper.



J. D. Murray, from Christmas Island, Indian Ocean. Formerly Mechanical Engineer of the Lackawanna.

J. C. Fritts, Master Car Builder, Delaware, Lackawanna & Western.

W. D. Robb, superintendent of motive power of the Grand Trunk, was ready for the opening session of the M. M. convention early Monday morning. The Grand Trunk is building 75 locomotives. Mr. Robb smilingly observed that although the brick arch had been used in locomotive construction in Canada during the past 35 years we, in this country, had only recently become thoroughly inter-

The Bostonians here at the convention spent most of yesterday celebrating Bunker Hill day. Of all the enthusiasts, Frank Barbey was the superlative degree; but, judging from some of the persons seen walking around with American flags pinned to their clothing, we suspect that Frank decorated some who are not Bostonians. For instance, J. Alexander Brown. Now, Alex. may be built like a bean eater; but why a Bostonian?

C. B. Flint and A. T. Chester, of the recently organized firm of Flint & Chester, arrived in Atlantic City Sunday with Mrs. Flint and Mrs. Chester, having driven down in an automobile. They are stopping at Haddon Hall. Mrs. Flint was formerly for several years with Manning, Maxwell & Moore. Mr. Chester is a graduate of Annapolis and has been in the mechanical department of the United States Navy for several years.

Walter E. Coffin, man-at-large and free lance in general for the National Malleable Castings Company, happened—just happened—to be in America and is attending the convention. Last year he was in South America on his wedding tour. Three years ago he was traveling in Japan. Next year he may be in South Africa. In the meantime, and for the purposes of these meetings, he is near the Greek Temple and keeping his eyes on what is doing around the throne.

D. J. Redding, assistant superintendent of motive power of the Pittsburgh & Lake Erie, reports building 22 heavy switch engines at the McKees Rocks' shops since last October. Plans are being developed for five consolidation locomotives, which will also be built at the company's shops. Mrs. Redding is not attending the convention this year because of the commencement exercises at the State Normal School from which the eldest daughter is about to be graduated.

W. F. Keisel, assistant mechanical engineer of the Pennsylvania, with Mrs. Keisel and their two sons, John and William, Jr., are staying at the Chelsea. They have just come from the commencement at Lehigh University, where Mr. Keisel attended the twenty-fifth reunion of his class and John Keisel attended his first class reunion. The party motored from Altoona to Bethlehem and then to Atlantic City. Miss Virginia Keisel will not be here this year, as she is in Europe taking an automobile tour on the continent.

William Garstang, superintendent of motive power of the Big Four, left for home yesterday. His wife and daughter, Virginia, who are at the Marlborough-Blenheim, will stay until the convention closes. The eldest daughter, Mabel, was married to Felix Robbins at Indianapolis two weeks ago yesterday. They, also, are attending the convention, having arrived last Friday. Mr. and Mrs. Robbins expect to make their home at Mr. Robbins' country place near New Madrid, Mo. Mr. Robbins is a Purdue man.

H. T. Bentley, president of the M. M. Association, is unfortunately confined to his bed in the Marlborough-Blenheim by a severe attack of malaria, which we hope will abate so that he can lend his enthusiastic presence and influence in presiding at some of the meetings before adjournment. Mr. Bentley wished through The Daily to express his appreciation of the many kind expressions of sympathy and offers of assistance that have come to him and his wife and daughter from hundreds of his convention friends.

C. Phillips, master mechanic of the New Orleans & North Eastern, at Meridian, Miss., a regular attendant at the conventions, is stopping at the Brighton with his young son. For a number of years Mr. Phillips has made a practice of bringing one of his children for company after they reach the age of eight or ten years. This is the fourth son; and the fifth one will be about the right age in a couple of years to attend the conventions. Mr. Phillips finds that besides the companionship, the boys themselves derive considerable benefit from these trips.

J. C. Pickard, president of the International Railway General Firemen's Association, arrived on Sunday and will remain through the Master Mechanics' Convention. The General Firemen's Association has been increased by 78 members since the last convention. The reports for the coming convention, which will be held at the Sherman House, Chicago, July 23-26, are all in hand and advance copies are being sent out. Among the more important papers are those on "Shop Organizations," by William G. Reyer and William Hall; "Shop Specialization," by U. T. Gale, and "The Relation of the Testing Department to Shop Efficiency," by J. S. Sheafe.

C. E. Gossett, general master mechanic of the Minneapolis & St. Louis, and father of the assistant mascot for the Western base ball team in Saturday's game, has some interesting stories about the severe weather in Minnesota and Iowa last winter. The weather bureau records show that the temperature at Marshalltown, Ia., was below zero for 26 consecutive days. A passenger train of three cars got caught in a snow storm in Minnesota and was stalled for 49 hours before the rotary snow plow reached it. The temperature was 38 deg. below zero. Fortunately a farm home in the vicinity was able to furnish plenty of food. When the rescue party opened up the way, the engine was able to get its train through to the terminal without assistance.

Daniel Smith, president of the Baker Heater Company, and of the Peter Smith Heater Company; Elmer Smith, secretary and treasurer of the same companies, and H. S. Williams, chief engineer, came by train as far as Buffalo, and motored from there to Atlantic City. They stopped en route for a short time at Elmhurst, N. J., where their families are spending the summer, and Daniel Smith has returned there. The Smith brothers recently have entered the heater business in the steam railway field by the acquisition of control of the Baker Heater Company, and this is their first year at the conventions. Elmer Smith is a base ball enthusiast of renown, and pitched for the winning Western team on Saturday. He is one of the principal backers of the Detroit Tigers, and at times has gone South with them on their spring training trips.

Under the guidance of W. J. Tollerton, mechanical superintendent of the Rock Island Lines, seventeen mechanical officers of that system visited the exhibits on the pier yesterday, going out one side of the pier and returning on the other. The other members of the party were: C. A. Seley, mechanical engineer; J. B. Kilpatrick, district mechanical superintendent; S. W. Mullinix, district mechanical superintendent; C. M. Taylor, district mechanical superintendent; George W. Seidel, superintendent of shops; George Goodwin, assistant mechanical engineer; L. A. Richardson, master mechanic; H. J. Osborne, master mechanic; F. W. Williams, master mechanic; T. W. McCarthy, master mechanic; E. F. Tegtmeyer, master mechanic; W. J. O'Neill, master mechanic; E. J. Harris, master mechanic; R. L. Stewart, master mechanic; C. L. Sharp, general foreman; W. J. Eddy, inspector of tools and machinery; and O. S. Beyer, Jr., traveling inspector. This is the first visit of many of these gentlemen to the conventions and the idea in going through in a party was not only to discuss the merits of the different devices, but also to give those who were visiting the convention for the first time an idea of the importance and value of looking over and studying the exhibits.

The Exhibit.

An interesting demonstration of the methods employed in the manufacture of the Jacobs-Shupert fire box will be carried on during the convention with the assistance of the Oxweld Acetylene Company, who will weld up the seams between the sections.

The "Gold Dollars" that are being given away at the booth of the Gold Car Heating & Lighting Company, New York, are much appreciated by railway men. The little treatise is designed to show how money can be saved by installing the Gold combination pressure and vapor system.

The severe service test to which the Mid-Western Car Supply Company's exhibit car was put on its journey from Chicago has clearly shown that its construction practically eliminates sharp flanges, end journal bearing wear and king pin troubles. It also permits the removal of the wheels without taking the trucks from under the car.

For the first time in America, a flash signal light for railway service is being shown at this convention. This is the mechanism such as is being used in lighthouse service applied to railway signals, and so arranged as to give any desired number of flashes a minute. The Commercial Acetylene Company, New York, has installed in its booth a flashlight operating in a standard Lehigh Valley lamp.

The McConway & Torley Company, of Pittsburgh, Pa., is calling particular attention to the steel castings which it is now manufacturing in addition to their other specialties. Samples of various car castings showing the class of material which it furnishes, are exhibited. These are made of the same high-grade mixture of acid open-hearth steel as is used in making the M. C. B. couplers, the tests of which require a high grade of steel of great uniformity, with high tensile strength. A specialty is being made of car castings such as center plates, push pole pockets, coupler striking brackets, brake connections, pedestals and similar castings.

NEW ARMORED AIR BRAKE HOSE.

An improved armored air brake hose is shown by the Sprague Electric Works, New York, in Booths 379-381. The design has been modified to obtain greater interlocking strength, and at the same time materially increase its flexibility. Features which have previously been criticised have been eliminated. One of the chief objections to the armored hose has been that the fittings and clamps could not be used with the standard M. C. B. hose; but with the Sprague 1⅜ in. air brake hose, no special fittings are required.

The fittings are secured with the standard M. C. B. clamps, but in such a manner that blow-outs are prevented. This is accomplished by means of what is called the armor clamp, which is welded to the armor (instead of being riveted as formerly), and extends under the M. C. B. clamp to engage with the collar on the nipple, or the head of the coupling, as the case may be. Another criticism of armored hose has been with regard to the quality of the rubber used, although it is generally recognized that the use of an armor not only affords protection against external injury and kinking, but by the elimination of stretching of the rubber, deterioration is very greatly reduced. This objection has been overcome by the use of a three-ply M. C. B. hose with the bursting test of the armored hose increased to 1,000 lbs. In order to conform with the M. C. B. badge as nearly as possible, the armor clamp on the coupler end is stamped with the railway's name, size of hose, date of manufacture, and maker's and serial numbers. With this interlocking armor the deterioration due to the sun's rays is prevented, which, in conjunction with the elimination of stretching, abrasion, kinking and blowing out of the fittings, results in long and efficient service. The exhibit also covers a line of armored hose for car heating, and steam and air hose for shop use.

BAKER VALVE GEAR ON OLD POWER.

Most railways have engines that are giving a great deal of trouble with their frames and valve gear. The frame troubles might be materially lessened and possibly removed altogether if the proper frame bracing could be applied; but the Stevenson valve gear prevents these improvements. If an outside valve gear and proper frame bracing could be applied, it is to be admitted the expense and work of keeping these engines in service would be very materially lessened. The machine shops are already overloaded, and these needed changes are put off from time to time.

The Baker valve gear offers an easy solution of the manufacture of the gears, as the Pilliod Company, New York, is in a position to make up these gears and the necessary parts ready to apply. This relieves the railway of practically all the machine work and leaves nothing but the easiest of erecting floor labor.

The roads that are now doing this find that it occasions no delay in the shop and enables the engine to make large mileage, in some cases the mileage being as much as six times what it was before. It does away with the engine coming in for repairs to frames and valve gears and the delays in the roundhouse for valve gear work.

After the gears are applied, the roads also find that the Pilliod Company's guarantee of 5 per cent. efficiency and economy is very conservative, and that the engine is always capable of handling her tonnage, because the gear has the wearing qualities and does not get out of adjustment.

PINTSCH MANTLE LAMPS WITH ELECTRIC IGNITION.

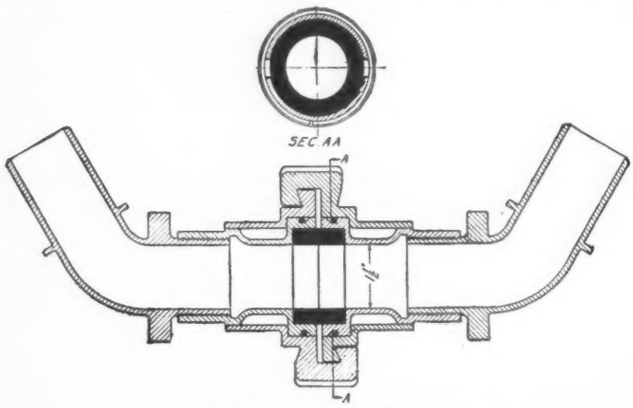
The Safety Car Heating & Lighting Company, New York, has several Pintsch mantle lamps among its exhibits equipped with a system of electric ignition. For some classes of car service, electric lighting fixtures have heretofore been preferable in the matter of convenience to the Pintsch mantle lamp, but with this new improvement and the several new types of fixtures equipped with it, the mantle lamp is placed on the same basis as the electric light from the standpoint of convenience.

All the lamps in the car, or as many as may be desired, can be lighted from one point in the car, doing away with the necessity of the trainman or porter lighting each individual lamp with a torch or matches; in fact, the occupants of the car are unable to distinguish whether electric light or Pintsch mantle light is used except from the increased illumination available with the mantle lamp. The arrangement of this system is simple, an igniting spark being generated by a magneto. The trainman or attendant of the car turns on the gas at the main cock located at a convenient point in the car, preferably the closet, and then turns the magneto handle and the lamps are lighted.

A modification of this arrangement has been designed for sleeping cars, to provide a direct control of the lamp by the occupant of the stateroom or compartment. Each compartment has its individual gas cock on the wall, provided with a combination gas cock and igniter. It is not necessary for the occupant of a stateroom to notify the porter when the mantle light is no longer required, nor is he compelled to ring for the porter when light is required, but the control of the lamp is directly under his personal supervision. No complicated mechanism is required, nor are any elaborate instructions necessary. The Safety Car Heating & Lighting Company has these lamps arranged at its exhibit where they can be demonstrated.

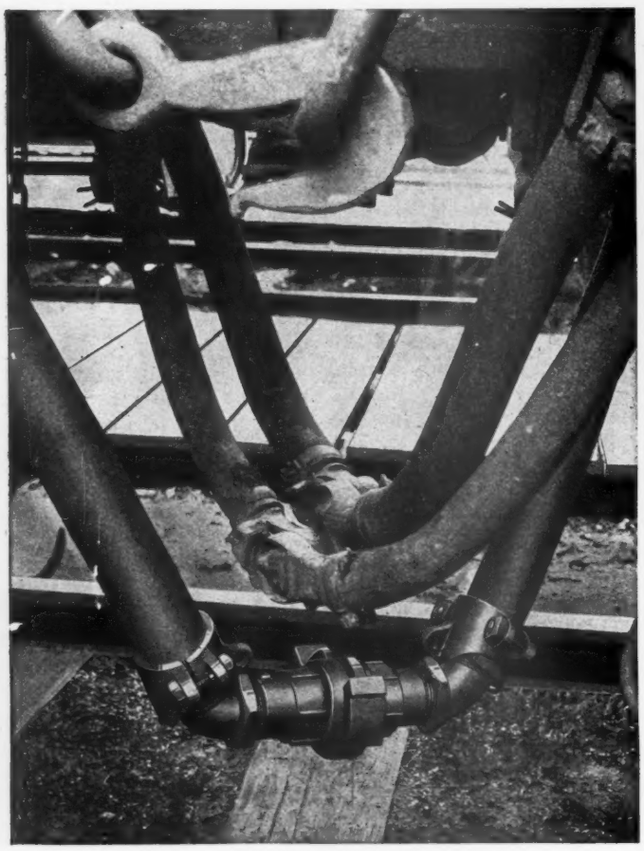
UTILITY STEAM HOSE COUPLER.

One of the chief causes of deterioration and trouble with steam hose couplers using rubber hose is that in bending the hose upward to couple and uncouple, it becomes kinked which reduces the inside area and also weakens the hose, causing it to give out at this point. A greater portion of the steam hose failures are due to this cause. The Utility coupler is designed



Utility Steam Hose Coupler.

to prevent kinking the hose. Each coupler head is surrounded by a loose collar and this collar has a projecting hook lug at one side and a helical flange extending nearly round the remaining portion. To couple two heads together it is only necessary to grasp one in each hand, swing them together face to face, so that the hooked lug of each collar engages the



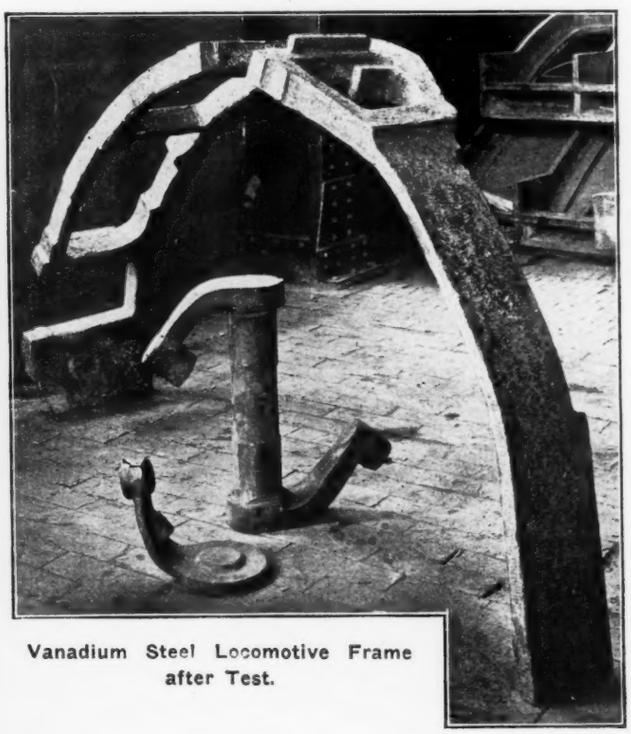
Application of Utility Steam Hose Coupler.

helical flange of the other. A twist of about a quarter turn forces the couplers firmly together, making a tight joint. A slight tap with a hammer tightens them so they cannot jar loose on the road. To uncouple, a reverse twist loosens them.

In addition to the saving of hose, this steam coupler has other advantages. The gaskets are brought together with their faces parallel so they wear evenly. The helical flanges take up all wear, as it is only necessary to turn the collars until a tight joint is made. No extra locking attachments are needed, as the couplers are always securely locked when coupled. The gaskets must always line up and a full 1½ in. opening is insured. This coupler is made by the Railway Utility Company, Chicago, Ill.

VANADIUM EXHIBIT.

It is getting to be a familiar story, that of the improvement made in the quality of steel by the introduction of vanadium, but it is a familiarity that cannot breed contempt and is still novel enough to make one stop and think and compare it with the ordinary practice of the day. So when we wander into the booth of the American Vanadium Company, of Pittsburgh, Pa., and find what looks and acts like real springs made of cast iron, and all sorts of gimcracks tied into all sorts of impossible knots; and see evidences of limits of elasticity that run from 90,000 to 113,000 lbs. per sq. in., we know that we are in the presence of the unusual. But we have seen tricks played with this steel before, and the real interest lies, in the eating of this metallurgical pudding, in the wear and tear of railway service. So when we see that pair of good conditional tender wheels with 258,529 miles totheir credit; and hear that their



Vanadium Steel Locomotive Frame after Test.

mates have gone 18,000 miles beyond this and are still going, we know that really we are in the presence of the unusual. This means nearly 11,500 miles per 1-16-in. of wear. Then there are some twisted and distorted locomotive frames in the background, of which 3,000 are in service and no failures. The one illustrated herewith was subjected to 15 blows, 17-ft. drop, and one blow, 12½-ft. drop, of a 3,000-lb. ball. The metal in these frames averages an elastic limit of about 49,800 lbs., with an ultimate strength of 79,500 lbs., an elongation of 27 per cent. and a reduction of area of 51 per cent. This is far enough away from the averages of ordinary steel to make one stop and think there must be something in it. Of course, there is! and if you ask George Norris what it is, he will frankly tell you that it's vanadium; and it is but fair to give him the credit of telling the truth.

Railway Age Gazette

DAILY EDITION

Copyright, 1912, by the Simmons-Boardman Publishing Co.

Vol. 52. NEW YORK—JUNE 19, 1912—ATLANTIC CITY. No. 24c.

PUBLISHED EVERY FRIDAY AND DAILY EIGHT TIMES IN JUNE, BY SIMMONS-BOARDMAN PUBLISHING CO., 83 FULTON ST., NEW YORK.

CHICAGO: 417 South Dearborn St. CLEVELAND: Citizens Bldg.
LONDON: Queen Anne's Chambers, Westminster.

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Subscriptions, including 52 regular weekly issues and special daily editions published from time to time in New York, or in places other than New York, payable in advance and postage free:

United States and Mexico	$5.00
Canada	6.00
Foreign Countries (excepting daily editions)	8.00
Single Copies	15 cents each

Engineering and Maintenance of Way Edition and the four Maintenance of Way Convention Daily issues, North America, $1.00; foreign, $2.00.

Entered at the Post Office at New York, N. Y., as mail matter of the second class.

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THOSE who have had an extensive experience with superheaters on stationary boilers using temperatures up to 660 and 700 deg. F. have expressed a decided opinion that 600 deg. F. is the limit at which the advantages of superheating can be obtained without excessive cost of maintenance due to high temperatures. It is known that between 500 and 600 deg. F. cast iron enlarges its volume and increases in weight. The carbon rearranges itself and experiments show that after one or two years' exposure to high temperatures the volume has increased 5 per cent and the weight 7 per cent. Copper and tin alloys are also affected by highly superheated steam and cast steel is better than cast iron or bronze for boiler fittings, piping and machinery where bearing surfaces will permit.

THE drop testing machine is probably the most useful device employed by railways in obtaining information as to the quality of iron and steel products which they buy in such large quantities. It was designed originally for testing axles, and its application has extended to the testing of rails, couplers, draft gears, wheels, and to such larger details as locomotive frames. In the report of the committee on Steel Tires, the drop test is for the first time officially recognized as an important element in a specification for such material. This will add to the expense for tires, as every drop test destroys a tire and it is paid for by the railway. The burden of this charge need not be large, as it should not be necessary to drop test a tire from every heat at a works where the process of steel manufacture is as uniform as it should be. This method of testing deals with the complete and finished structure and is therefore an improvement over the previous methods used in this country which deals only with tensile specimens taken from a small test ingot and chemical analysis from the same small ingot. It might be employed at first on a single tire from one order or for one lot of locomotives. The effect on the effort of the manufacturers would be almost as great as if a large number of tires were destroyed at considerable expense. The drop test for tires has been used in European countries for many years and it is surprising that it has not been adopted here before. As a new and radical departure from previous methods it would have been interesting and instructive if the committee had given some account of the experience gained by drop tests of tires in foreign countries with examples showing the basis of the requirements which they now recommend.

THE discussion of the report on the Contour of Tires for Engine and Tender Trucks indicated that there is a reluctance on the part of quite a number of roads to adopt either the old standard or the new one proposed. There has been a gradual modification of opinion as to the necessary height of the flange of steel tires to secure safety from derailment. With the general improvement of the track surface it has been possible to reduce the height to 1⅛ in. for the drivers of road engines, and there was little, if any, opposition to the proposed standard height of 1 in. for engine and tender truck tires. In fact, some lines have used a height as small as ⅞ in. for switching engines, and it is possible that a flange 1 in. deep could be safely used for the driving tires of slow speed freight engines. The reduction in the height of flange will effect an important economy in the expense, as there will be less steel wasted from the tread in restoring a full flange to worn tires. The principal feature of tire contour about which there is the most disagreement is the standard taper which some regard as too sharp, as it requires a greater amount to be turned from the tread of worn tires, and some have the idea that it increases the eccentric load on the rail enough to break down the head. This latter view has been attacked by competent authority, and the advocates of a cylindric tread for tires will not find any strong support for their theory. Other lines have carried the standard taper clear to the rim with a heavy champfer at the edges. This contour takes less time for turning and there is an apparent saving in the amount of steel turned off. The objection to a flat taper on the cylindric tread is that the wheels tend to run to one rail or the other, and flange wear is increased and so also is track resistance. Probably there will always be some departure from any standard tire contour for the reasons here given, and some latitude should be allowed for this for tires used in the less important services. It is best, however, to have a standard for the faster road engines, and that which has been recommended by the committee should be adopted with this in view.

IT is unfortunate that all the members of the Master Mechanics' Association cannot have an opportunity to see the moving pictures exhibited by D. C. Buell at the Railway Fuel Association convention in Chicago last month. These pictures demonstrated a method of instructing firemen in proper firing practice and by giving visible evidence of the effect of incorrect methods, impressed the lesson far more effectively than is possible with text books, lectures or even personal example on the locomotive. Those observing this demonstration could not avoid having a mental picture of the fireman in the act whenever they observed the effect of wrong practice. It would be difficult to prevent a thought of the pile of coal on the platform, shown in one picture, whenever a locomotive is seen with the safety valves blowing or of the fireman "baling" in the fuel as fast as he could when continuous black smoke is seen rolling out of the locomotive stack. There was no doubt in the minds of those seeing the pictures that this new scheme will prove to be the most powerful agent yet discovered for instructing men of the class and age of the general run of new firemen. Proper firing is not the only lesson that can be taught by this means. It is applicable to any kind of work where the movements, action or methods of the workman are the influencing factor. Apprentices can be taught shop work, trackmen how to properly tamp and spike, trainmen and yardmen how to handle cars, etc. New methods or machines of any kind can be demonstrated more effectively than in actual practice as the films can be run through many times and can be operated very slowly, permitting every detail to be thoroughly studied. In fact, a moment's study will bring to mind almost numberless ways in which the idea can be applied. Conventions of this kind are largely depended upon to bring out the latest and best practices in the field and it is hoped that next year, this new idea can be illustrated to the members by either Mr. Buell or some one who takes it up in the meantime.

THE official registration of this year's M. C. B. and M. M. conventions up to late yesterday afternoon, compared with the full registration from 1908 to 1911, is shown by the following table:

	1908	1909	1910	1911	1912
M. C. B. & M. M. members..	504	523	530	552	543
Special guests	530	723	732	820	629
Railway ladies	595	618	632	690	408
Supply ladies	254	272	356	385	246
Supply men 1,177	1,362	1,526	1,653	1,486
Complimentary			40	47	49
Total 3,060	3,498	3,816	4,147	3,361

The figures contain no duplication of names. That is, those persons who registered as members or guests of both railway associations have in every case been counted but once; so that the table represents the actual number of persons who registered from the opening day until late Tuesday afternoon. It will be seen that while there was an apparent falling off this year as compared with June last of 786 persons, but nine were railway men and 191 special guests of either the M. C. B. or the M. M. association. Of the 191 special guests, it is hard to say what proportion were railway men; but not all were railway men. As a matter of fact, it is pretty well agreed that more, rather than less, railway men attended this year's conventions. The discrepancy in registration is due in part to the fact that the M. C. B. association this year charged its members and guests for all badges; and with both railway associations badges were not given out as freely as heretofore. It would be interesting to know the average amount of time spent here by each railway man this year as compared with a year ago; but naturally a computation of that kind is not now possible. Whether or not the increased attendance at the meetings and other ocular evidence contradicts the registration, it is nevertheless true that the businesslike attitude of the railway men, and their increased interest in the exhibits, gives one the distinct impression that this year's conventions were bigger and better than those held a year ago.

CONSOLIDATION

AGAIN the movement for the consolidation of the two great railway mechanical associations seems to be on the verge of settling back into a condition of quiescence. It was reported at the Master Car Builders' convention that the matter was being considered from the legal standpoint, but there was no intimation of what might be the objections or whether there were any probability of their being overcome. The consolidation committee of the Master Mechanics' Association went still further, or perhaps not as far, by reporting that there seemed to be a sentiment adverse to consolidation, and that the usefulness of its committee was at an end. The committees of both associations have been continued to the next meeting of the executive committee, with the seeming probability of their going out of existence immediately after that meeting.

The matter of such a consolidation is a most important one. The two associations have undoubtedly given more valuable technical literature to the world than any others. Outside their own membership there is a wider interest that would make against anything that would tend to curtail or depreciate in the slightest the output of the future.

The subject has been up for periodical consideration for the past twenty years or more. At first the suggestion came from the Master Mechanics' Association and was vehemently and emphatically approved by the master car builders, because the latter were, at that time, lesser officials, and were not recognized as of serious importance in the railway world. It was the opinion of the members that if a consolidation were effected the result would be the obliteration of the influence of the master car builders. With the advent of the representative member and the official control of the formulation and administration of the rules of interchange the tables were turned, and the master car builder became the prominent factor. This destroyed that feeling of jealousy that had previously existed and changed the source of opposition completely.

The argument for consolidation has been based, of recent years, on the ground that the same men control both locomotive and car departments, and that it is absurd that some men should be master car builders one week and master mechanics the next, simply because they were considering cars at one time and locomotives at another, while both have so many things in common. The plea for the continuance of the old conditions is based on the standing of the minor officials who are still separated into the two classes of car and locomotive men, and who each have their interests and problems that deserve attention. The argument for one association and one long week of convention work is answered by the statement that there are limits as to what men can and will do. A full week of continuous convention is too much, and the two days of relaxation between the present sessions permits of the prolonged period of interest without weariness, while, for those who do not attend both conventions, there is really no loss of time.

The result is that the opposition to consolidation has ceased to be an association matter and has become a matter based on individual opinion. Individuals are for or against it, regardless of whether they are car or locomotive men, and from present indications those favoring it are decidedly in the minority.

LOCOMOTIVE BOILERS

IT is so difficult that the difficulty amounts to an impossibility of considering within allowable limits that wide range of compiled practice and experience brought together in the report on the Design, Construction and Inspection of Locomotive Boilers. It is so comprehensive and covers so wide a field that even the convention seemed to be at a loss as to the best method of approaching and handling it in discussion. The result was that it skirted along on the edges, made a dab at some of the details, lost sight of others entirely and showed by all signs that it needed more time than was available to discuss fully this exceedingly important subject.

As it was, it confined itself exclusively to details with one important exception and that lay in the announcement of the policy that it had been decided to pursue in regard to the Federal boiler inspection, which does not seem to be progressing as smoothly as might be desired. The trouble lies mainly in the difference in the interpretation of the law by the district inspectors. The movement, therefore, is to secure uniform instructions for the inspectors. To attain this end the large committee, so distributed as to be representative of the whole country, is a proper one and will probably be an efficient means of dealing with the problem.

Aside from this the discussion and the report dealt with details that were almost innumerable: the shape of staybolt heads, the use of the combustion chamber, the width of water legs, the flanging of the fire door, the scarfing of plates at the round ring, the radius of round ring corners, the comparative influence of coal and oil on the sheets, the methed of fastening tubes, and so on, and so on. But there was one feature noticeable throughout the whole, and that was the slight differences of opinion expressed and how those slight differences might be explained by differences in the local conditions that called them forth. The widest difference, perhaps, was expressed by the two speakers, one of whom rather favored, though he by no means advocated, the return to the narrow water leg of the firebox as contributing to an improved steaming of the locomotive, and another who was getting most excellent results with a 7 in. leg. No very specific data was offered by either, but the coal and water, as well as the traffic conditions, of the two roads were so different that it was scarcely to be wondered at that they found a difference in boiler construction desirable.

It seemed strange, with the possibilities before them, that the effect of check valve location for the feed, the circulation, the stresses on braces and sheets did not receive even a passing notice.

The expression of the opinion that the locomotive boiler was destined to grow in the future, and that the limits of its development had not been reached, showed confidence in its construction, and the brief outline of its history from the crownbar type with the narrow firebox to the almost universal use of the radial stay with the Belpaire as a side or intermediate construction was an interesting summation of what had been done. The mechanical stoker seems to be the instrument that is looked for to modify firebox and boiler construction, and especially to modify its dimensions. This seems to be especially probable in view of two facts that have been brought out: one the great quantity of coal that the mechanical stoker can handle, and the other the recent tests showing the high percentage of the total evaporation of the boiler that is attributable to the firebox. The combination seems to indicate the uselessness of adding to the length of the tubes and the desirability of adding to the length and width of the firebox and the use of the combustion chamber.

These are some of the more important of the items touched on and regarding which there might be and will be much discussion in the future. Whether they will be treated with the same thoroughness that was given to the details of construction in the paper of this year remains to be seen. But the committee that will probably be appointed to report on the operation, care and maintenance of boilers at the next convention has a large subject to handle, a broad field in which to operate and an opportunity to present a report that will be second to none in interest and value, not even to this most excellent one which was presented yesterday.

THE ENTERTAINMENT FEATURES.

PROBABLY no other subject has been so much discussed during this year's convention as the entertainment features. The entertainment programme had been gradually elaborated in past years until it had come to include a large number of formal affairs. It had become the custom to wear formal dress for these formal occasions, and there had developed a good deal of display, and even of rivalry in this display. The joint executive committee, composed of the presidents of the Master Car Builders' Association, the Master Mechanics' Association and the Railway Supply Manufacturers' Association, after mature consideration, decided that, in view of existing conditions in the railway business, a change should be made, and this was done. The formal receptions to the officers of the associations were abolished, and informal evening social gatherings substituted. Similar action was taken in reference to the grand balls, which were superseded by informal dances. The vaudeville entertainments and the card parties with their prizes, were eliminated. The furnishing of roller chairs for railway men, supply men and their guests, by the Supply Association was stopped, each being left to pay his own way. The members of the entertainment committee have appeared at evening social functions in their business suits. The much reduced entertainment expenses have been borne jointly by the railway and supply associations instead of—as in past years—by the supply association.

These were radical changes, and it is not surprising that many expressed grave doubts as to their probable effects, and that honest opinions have differed widely as to their wisdom and results. Many believed that one effect of the reduction of the public general entertainment would be an increase in the amount of more or less concert entertainment of individual railway men by individual supply men, and all agreed that this would be an undesirable consequence. The Daily has closely observed the course of events and made inquiry of numerous persons, and in spite of some conflict in the evidence, our conclusion is that there has been no increase in individual entertainment this year, and that probably there has been even a reduction in it. Never in the history of the conventions, in our judgment, have those attending them been more careful in their conduct. There has, however, been a good deal of complaint about the entertainment features being "slow"—a thing which, of course, no one charges up to the entertainment committee, which has simply acted under orders. Many have also thought that the informal dressing has been carried to an extreme. The worst complaint of all has been made because of the failure this year to provide rolling chairs free for all persons wearing badges.

If one is to reach a correct conclusion as to what should be done about the matters referred to, he must begin by considering the purpose of the mechanical conventions. Their object is to afford the mechanical officers of the railways opportunity to so increase their knowledge of the important and difficult subjects with which they have to deal as to increase the efficiency of their labors for the railways by which they are employed. Anything that interferes with the attainment of that object has no proper place among the features connected with these conventions. During recent years the limelight of publicity has beaten with increasing fierceness on the railways, and their execu-

tive officers have grown more and more sensitive regarding the doing of anything which might be construed in such a way as to reflect any discredit on railway management. The original intimation that the soft pedal should be applied to certain diversions in connection with the conventions, which might be perfectly innocent but open to misconstruction, came from the executive officers, and the changes made this year amounted to an expression of opinion by the executive officers and men of leading influence in the mechanical associations, that some features in connection with the conventions interfered with their serious business or were open to misconstruction. It was felt that the formality of some of the entertainment features caused some persons to dress with a lavishness that was excessive for such occasions, and that the costly dressing of some restrained others, who were quite unable to compete with them, from attending the grand balls, the card parties, etc. It was also felt that the policy of permitting the supply association to defray all of the expenses of entertainment, including the cost of the rolling chairs, was open to the criticism that it established an improper relationship between the supply fraternity and the railway men.

The RAILWAY AGE GAZETTE expressed the opinion after the conventions a year ago, and reiterates it now, that it is not the entertainment of all the railway men by all the organized supply men that may do harm, but excessive individual entertainment. Undoubtedly, however, the most satisfactory plan of all is for the railway associations to share in the entertainment expenses as they have this year. The supply men, with great enterprise and at great expense, furnish the greatest exhibit of its kind ever made in the world. Why should they be put to the additional expense of paying for all of the entertainment, too? Certainly there is no objection to those who are anxious to wear their evening clothes doing so; but the feeling that this is a necessity at social affairs in connection with purely business conventions has been simply ridiculous and ought to be ridiculed to death as it deserves.

It would seem that in the future all of the social features—if the conventions continue to be held in Atlantic City—should be held in the evening on the pier where there is plenty of room; and one of the greatest improvements that could be introduced would be that of keeping the exhibits open at night. This is done at practically every other industrial show in the United States, whether it be the Railway Appliances Association's exhibition in Chicago, or an automobile show, or an agricultural show. It is not every railway man who attends the conventions that wants to dance, and if the exhibits were kept open in the evening and all the social affairs were held on the pier, while those who wanted to were attending the social affairs, those who preferred to be looking over the exhibits could be doing that. It could easily be arranged for the representatives to the supply concerns to take charge in turns of the exhibits at night. Many railway men come to spend only a day or two at the conventions, and we have no doubt that they, and also many who stay much longer, would welcome as a great improvement the innovation of keeping the exhibits open at night.

Whatever criticisms the plan followed this year may be subject to, it is a move in the right direction. The one principle to be borne in mind is, that everything else should be made decidedly subsidiary to the business purposes of the associations. The sessions of the conventions come first, and full opportunity to study the exhibits comes next, in importance; and whatever, to any considerable degree, interferes with these things, or may be construed as interfering with them, should be frowned down. The extent to which these things are borne in mind, and action accordingly taken, may determine the entire future of the conventions and the exhibit.

Announcements.

TO-DAY'S PROGRAM.

M. M. ASSOCIATION.

Discussion of Reports on:	
Safety Appliances	9.30 to 9.45
Flange Lubrication	9.45 to 10.30
Minimum Requirements for Headlights	10.30 to 11.00
Standardization of Tinware	11.00 to 11.15
Maintenance of Superheater Locomotives	11.15 to 12.00
Engine Tender Wheels	12.00 to 12.30
Resolutions, Correspondence, etc	12.30 to 12.40
Unfinished business	12.40 to 12.45
Election of officers	
Closing exercises	12.45 to 1.30

B. & O. CLUB.

In addition to those B. & O. men who met Monday and organized the B. & O. Club, the following B. & O. men signed the register on the desk of the American Car & Foundry Company in its space No. 610; also there were several in attendance at the meeting whose names were inadvertently omitted: J. F. Deems, J. B. Emory, Rush Gramm, Harry M. White, F. J. Cole, H. H. Hale, A. H. Reeves, J. T. Carroll, D. H. Reeves, O. C. Cromwell, E. J. Searles, John Moran, S. C. Granis, C. M. Harris, F. H. Carr, J. F. Francis, E. P. Stevens, C. W. Burke, F. P. Pfahter, G. W. Keller, F. C. Schorndorfer, H. D. Van Valin, L. A. Kennedy.

Present and past employees of the B. & O. who regularly attend the annual M. C. B. and M. M. convention are invited to join the club and to send their names and addresses to the secretary, Charles L. Sullivan, 1601 McCormick Building, Chicago.

FOUND.

A small enameled high school or college pin. Apply to Secretary Conway's office.

BADGE PRESENTED TO PRESIDENT STAFFORD.

It is the custom of the Railway Supply Manufacturers' Association to each year present its retiring president with a past-president's badge. The badge presented this year to Mr. Stafford was accompanied by the following letter, signed by all of the other members of the committee:

"The position of president of the Railway Supply Manufacturers' Association is one of honor and distinction. The conferring of that honor upon you was richly deserved, and the wisdom of that action is proven by the distinguished credit to yourself with which you have filled the post.

"During your administration you were confronted with new and perplexing problems, affecting not only the immediate welfare, but the future, of our association. The careful, conservative manner in which you solved these problems and the consecration of time and effort in their solution, call for the highest commendation.

"The association, through its executive committee, in presenting you this past-president's badge, exercises the only means it has for material expression of its appreciation of the magnificent performance of the exacting duties; but it acknowledges thereby its debt to you for your faithful, self-sacrificing and highly efficient service. The badge itself tells its story of honorable ambition most creditably achieved.

"The responsibilities of office you will soon lay on other shoulders; but the satisfaction of duty well done, and the affectionate regard of your associates, are yours for all time."

Proceedings.

Vice-President Crawford called the meeting to order at 9.50 a. m.

CONSOLIDATION.

Chairman Crawford: This committee has given consideration to the subject of consolidation, and would report that the general feeling does not seem to be in favor of it. The matter was quite well expressed in President Bentley's address yesterday, but inasmuch as the M. C. B. Association has continued its committee on consolidation, at least until such time as the executive committee meets again, Mr. Crawford made a motion, on behalf of the committee, that the committee of this association be continued, at least until the next meeting of the executive committee.

The motion was seconded and carried.

F. F. Gaines (C. of Ga.): I would ask if, in continuing the committee, the committee will consider the suggestion of President Bentley relative to the proposed change in the meeting time. He made some suggestions in his report to that effect.

The Vice-President: I should say that would be considered by the executive committee at the July meeting, when the committees are appointed, and such matters are given consideration.

DESIGN, CONSTRUCTION AND INSPECTION OF LOCOMOTIVE BOILERS.

The committee has the following report to make in regard to design and construction of locomotive boilers: The report on inspection was presented to the members at the last convention. A circular of inquiry was sent to all the members of the Association in regard to their experience and recommendations concerning the construction of locomotive boilers. Replies were received from 29 members, comprising a total of 29,355 locomotives, including the supplementary report that was presented at the convention. The intention of this committee is to give the different members the benefit of the experience of the different railways.

Type of Boiler.—In no case is a special type of boiler used for any special service. One of the members advises that they use Belpaire boilers of crown bar construction for road engines entirely on account of greater ease in maintaining staybolts. Another member advises that they use the Belpaire boiler as well as the radial stay boiler, and their experience with the Belpaire

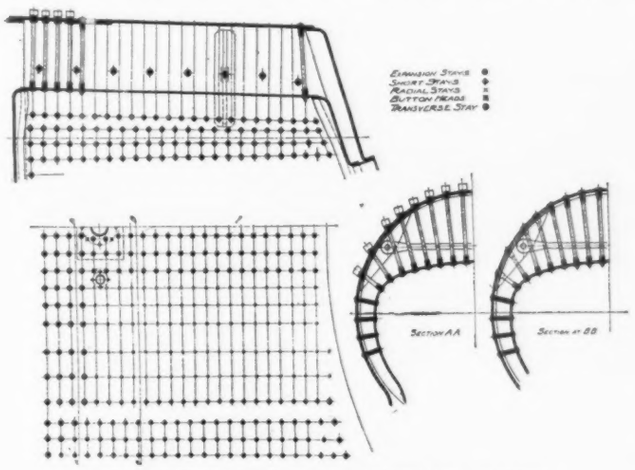


Fig. 1—Crossbracing for Locomotive Firebox.

boiler is that it reduces the number of staybolt breakages. From the experience that they gained with Belpaire boilers, they developed a system of cross-bracing, shown in Fig. 1, which has practically all the advantages of the Belpaire staying, and in addition it reduces the dead weight and is cheaper to construct.

A member of a road operating over 1,000 locomotives advises that they use Belpaire boilers with button heads to support crown sheet, claiming it is stronger, easier to clean and gives more steam space. Another member from a road operating 900 locomotives advises that they have engines with Belpaire, radial stay and crown bar boilers; crown bar boilers are used on older type of engines and have proven unsatisfactory. Radial stay boilers have been used on later types of engines and have generally been satisfactory, except in bad-water districts where broken stay bolts and cracked firebox sheets have given more trouble as compared with the Belpaire boilers used in the same district. This is attributed to a more equal distribution of stress. Radial stay boilers are used on passenger, freight and switch engines where Belpaire is used only on freight engines.

From the replies received from the different members it is the consensus of opinion that the radial stay type of boiler is preferred, as it is easy to construct, giving more free circulation of water, less deposit of sediment on the crown sheet and easier to wash out; also the dead weight is kept down considerably.

Combustion Chambers.—From the replies received the combustion chamber is only favored by 5 members. One member, who uses the combustion chamber covered by Fig. 2, advises that it shows a great economy in fuel, a decrease in the amount of

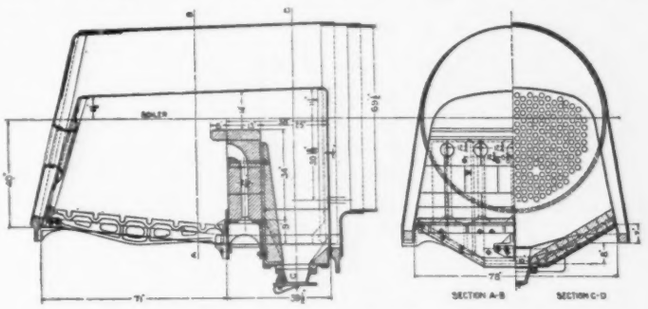


Fig. 2—One Type of Combustion Chamber.

smoke and cinders and increased mileage. No information was given in regard to maintenance. Another member advises that the reason they favor the combustion chamber in certain types of boilers, such as Mallet, is that it keeps the tubes a reasonable length and increases the heating surface of firebox. No information was given as to the fuel economy derived from these combustion chambers, but a saving in maintenance and an improvement in performance is reported. The type of combustion chamber he uses is covered by Fig. 3.

Another member reports being in favor of combustion chambers, but does not have them on all engines. This member was

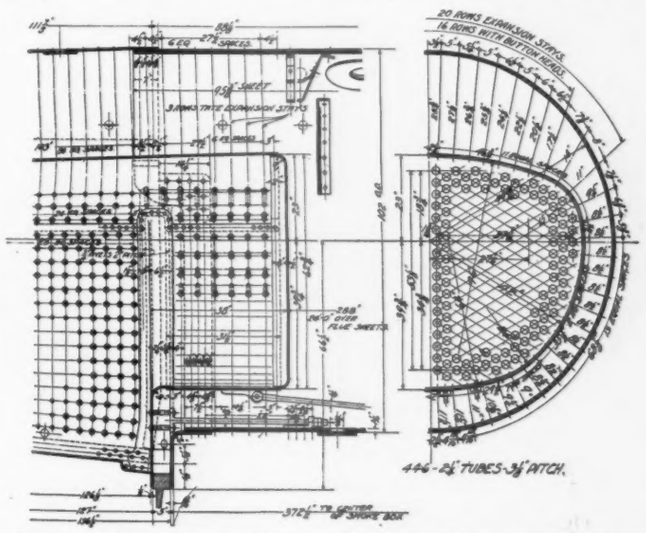


Fig. 3—A Combustion Chamber that has Given Good Service.

from an anthracite road and the particular claim was they thought they got better combustion and also derived a good deal of benefit in the way of protection of flues, particularly so, the boxes being extremely shallow below the flue sheet. Another member advises that they have had all combustion chambers removed on account of costing too much to maintain.

The advantages claimed by the use of combustion chamber are that it keeps the tubes within a reasonable length, protects the flue beads, increases the firebox heating surface and gives better combustion.

The committee feels that a combustion chamber is desirable on boilers with extra long flues, such as Mallet and Mikados, but are not prepared to recommend any particular design.

Firebox.—Continuous crown and side sheets are favored by all

of the members except one. Therefore, the committee recommends the use of continuous crown and side sheet for new construction or with renewal of firebox.

Mud-ring Corners.—The committee recommends mud ring with large radius, and the flanges of the tube and door sheet should be carried back far enough to get at least three straight rivets through the ring. Scarf the inside sheets down to be properly fitted to the mud ring by heating them. If the scarfing and the fitting of these sheets is given proper attention it will overcome leaky mud-ring corners that some of the members are now experiencing considerable difficulty with.

Throat Sheet.—From the replies received, the distance from the top of the grate to the bottom of the lowest boiler tube on wide firebox engines is a minimum of 14 in. and a maximum of 26 in., average about 22 in. Narrow fireboxes have a minimum of 13 in. and a maximum of 28½ in., average about 20 in. One member who uses hard coal advises a distance of 8⅛ in. minimum and 12 in. maximum. This height is limited due to the design of the locomotive.

The committee recommends as deep a throat sheet as the

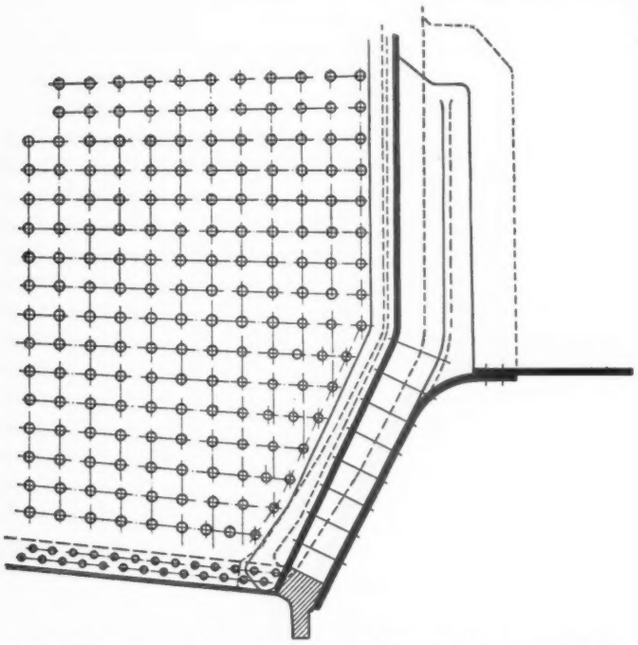


Fig. 4—Recommended Design of Throat Sheet for Boilers With Sloping Mud Ring.

design of the locomotive will permit. The committee also suggests the design of throat sheet as shown in Fig. 4, on boilers with sloping mud ring to allow for more uniform spacing of stay bolts and location of arch tubes and simplifies the flanging of the throat sheet and flue sheet. One of the members operating over 1,500 locomotives uses this design on the latest type of boilers. Boilers having a sloping mud ring with a firebox 60 in. long by 68 in. wide, throat sheet is 25⁵⁄₁₆ in. deep; fireboxes 120 in. long by 61. in wide, throat sheet is 15⅝ in. deep.

From the replies received in regard to thinning out of flue and door sheets, also the use of countersunk rivets where these sheets are joined to the side sheets, you will find the different methods followed out in Fig. 5. About 50 per cent. of the members thin out these sheets and apply countersunk rivets. It is generally acknowledged that the thinning of the sheets and the countersinking of rivets is necessary on oil-burning locomotives. The general practice seems to be to countersink these rivets about half way up the side sheet. No data were given in regard to which practice is the best from a maintenance standpoint.

Spacing of Rivets in Firebox Seams.—The committee suggests ¾-in. rivets spaced 2 in. apart, as this is used by the majority of the members who replied to the circular.

Design of Fire-door Hole.—Fig. 6 shows various designs of fire-door holes used by different members. Five members advise that they use style No. 2, which is the O'Connor type of fire-door. One of the members reports that they have 1,200 locomotives equipped with the O'Connor type of fire door for a number of years. On boilers equipped with this type of fire-door flange they have had several cases where the door sheets have remained in perfect condition although two sets of side sheets and a second back-flue sheet had been applied and cracked badly. In every instance the door hole remained in practically perfect condition when the rest of the firebox was cracked to the point of renewal. Boilers equipped with this type of fire-door hole gives larger water space, fewer stay bolts about the door seam, seems to give freedom for expansion and contraction and also largely prevents mud and scale collecting

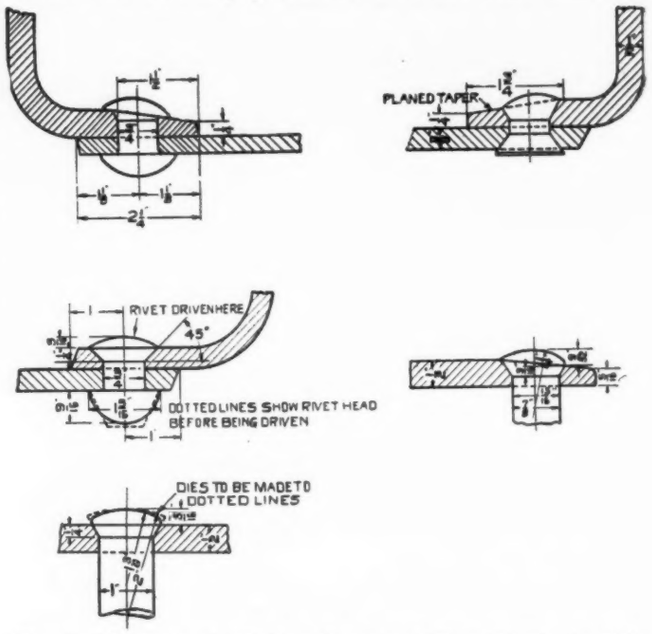


Fig. 5—Methods of Jointing Door and Flue Sheets to Side Sheets.

at this point. It seems to the committee that style No. 1 would have a tendency to collect mud and burn out. The committee has no choice between styles Nos. 2, 3, 4, and 5.

Number and Size of Fire Doors.—It is found that various

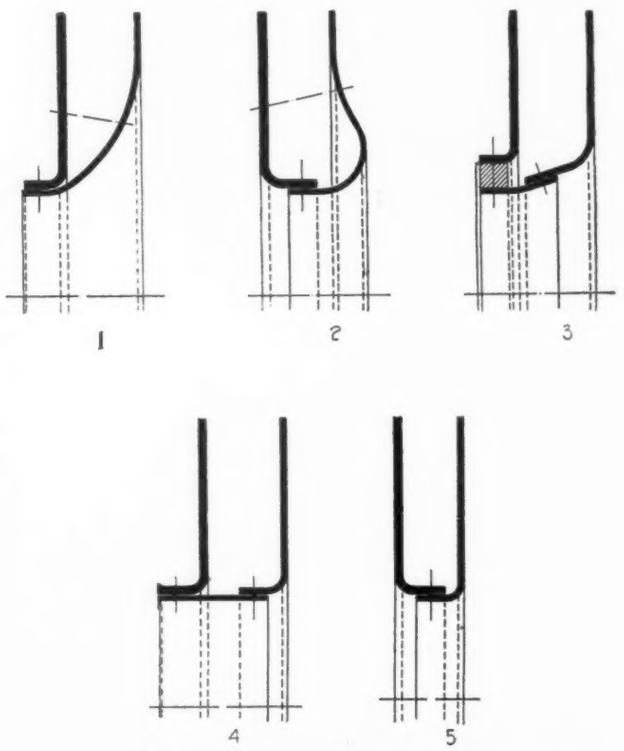


Fig. 6—Types of Fire-Door Holes.

sizes and numbers of door holes are used on different types of boilers.

Arch Tubes.—Of the replies received, 20 members use 3-in. tubes, one member uses 2-in. tubes and one member uses 2¼-in. tubes. Eight members do not use arch tubes at all. One

member supports brick arches with studs fastened into the side sheet.

Thickness of tubes used: 15-in., 165-in., 18-in., 203-in., 25-in. Eight members use thickness of .18-in. Eleven members use seamless steel, one member uses charcoal iron, thickness of tube not given.

Plugs or Plates for Covering Arch Tube Holes in Throat Sheet and Back Head.—Fourteen members use brass plugs, one member uses extra large size brass plugs for covering the holes; these plugs are drilled for 2¼-in. plug so as to avoid removing the large brass plugs when washing the tubes. Three members use plates with ball joints, as shown in Fig. 7, claiming greater ease in removing and applying in close quarters.

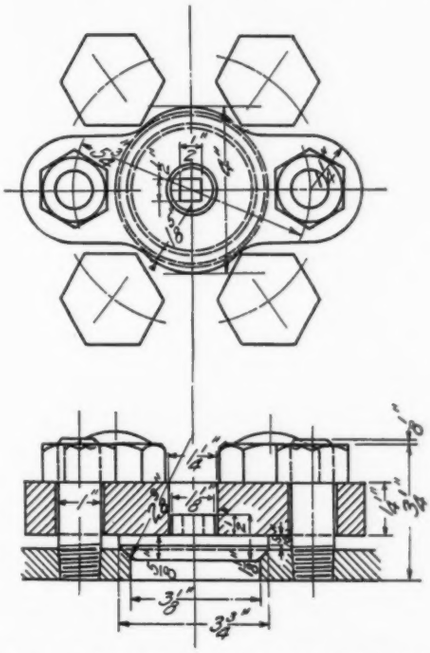


Fig. 7—Plates for Covering Arch Tube Holes.

Method of Setting Arch Tubes.—The setting of arch tubes varies. The replies received were indefinite as to just what practice they are following out. Six members did not state whether they use copper ferrules or not. Nine members advise that they use copper ferrules in setting arch tubes. Three members set the arch tubes without ferrules. Three members set the tubes with a roller expander and a sectional expander to be used in the ordinary manner to set out the tube, as shown in Fig. 8 (A). Tubes are then beaded over with a bootleg

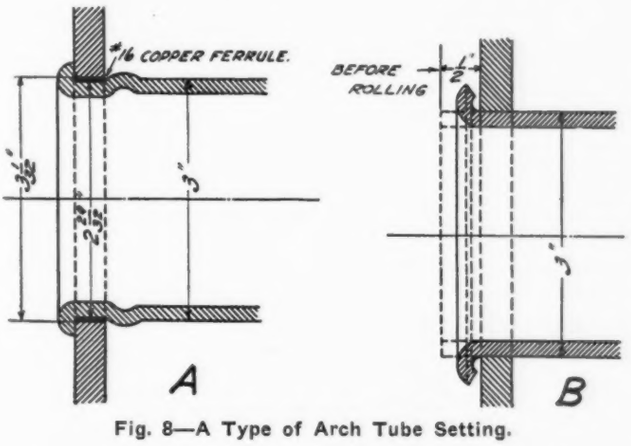


Fig. 8—A Type of Arch Tube Setting.

tool, except by one member who bells out the tube on the water side to prevent the tube from pulling out of the sheet. This member does not use any ferrules. The other two members do use copper ferrules. Fig. 8 (B) shows the arch tube setting as used by one member.

For the information of the members you will find complete set of instructions for setting arch tubes, which is being used by several large roads with success. This covers tubes expanded and beaded on the outside as follows:

Original holes in firebox sheet must be 3 3/32 in. in diameter. Worn holes must be reamed when more than 1/16 in. out of round. Sharp edges must be removed by slightly rounding with file or reamer.

Copper ferrules must be used at both ends of arch tubes. Ferrules should be 3 in. outside diameter, .095-in. thick and 5/8-in. long, expanded by carefully hammering on a round mandrel to snugly fit the hole. Ferrules should be set with 1/16-in. projection on each side of sheet and secured in place with a roller expander.

Tubes must be 3 in. outside diameter, 18-in. thick seamless drawn steel. The tubes should be cut to proper length and bent to template conforming with drawings. The length can only be determined by actual measurement of the firebox and allowance must be made for projection of ½ in. into water space at each end of firebox. Tubes must then be securely fastened with the roller expander. See Fig. No. 1, in Fig. 9.

After tubes have been set they must be flared at both ends with the flaring tools shown in Fig. No. 2 of Fig. 9. After the tube ends have been thoroughly flared the tube ends are then ready for beading.

Additional flaring with tool shown in Fig. No. 3 of Fig. 9, is necessary to start the bead. The bead must then be formed with special beading tool, Fig. No. 4 of Fig. 9. Notice that it is not desired to form a full bead. The bottom of bead should stand 1/16-in. clear of the sheet.

These tubes should be thoroughly examined and cleaned at each washout of the boiler. At the least indication of scale formation in the tubes the pneumatic tube cleaner must be used. The tube cleaner should be secured

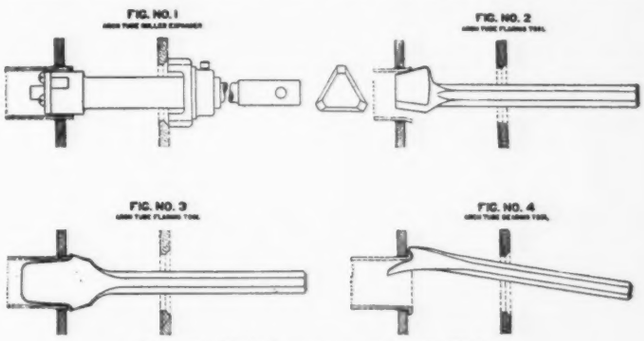


Fig. 9—Maintenance of Arch Tubes.

to a length of ½-in. air hose to which is attached another ½-in. hose for supplying water while cleaning. Care must be taken so as not to break the cleaning cutters by allowing the cleaner to be pushed through the opposite end of the tube. A stop must be provided on the hose set at the proper length for this purpose. The tube cleaner must be lubricated with signal oil fed through a lubricator in the air-supply pipe at the rate of 30 drops per minute. After cleaning, the tubes must be inspected by holding a light at the opposite end of the tube to make sure that the tubes are thoroughly cleaned and free from scale. Leaky tubes must be stopped from leaking by rolling with an expander. Before rolling the tube ends must be thoroughly cleaned from scale.

The committee has been unable to get any information in regard to which type of flue setting gives the best service, therefore are unable to make a recommendation as to which type should be recommended as standard practice.

Radius of Flange in Back Tube Sheet.—Replies received in regard to the radius in the back tube sheet where it connects to the crown sheets. Recommendations were made from ½ in. up to 2 in. Some members had trouble with cracked sheets and leaky seams with large radius; others had trouble with the small radius. One member advises that he is now experimenting with a 4-in. radius and it seems to give good satisfaction, but it has not been in use a sufficient length of time to give a complete report. Two members increased the radius from ⅞ in. to 2 in. and had considerable trouble with the flue sheet working up and the flanges cracking. Two-inch radius has been discarded and they are now using ⅞ in., which improves the condition but does not eliminate the difficulty entirely. Another member reports a 3-in. radius satisfactory.

Distance from Inside of Flange of Back Flue Sheet to Edge of Flue Holes.—The committee recommends that a distance from the inside of the back flue sheet to the edge of the nearest flue hole to be ample to prevent the flue sheet cracking through the flange. This distance will vary, depending on the radius of the flange of the tube sheet. In tube sheets with ⅞-in. radius, this distance should be at least 2 in. at the top, ⅞ in. on the side. Sheets with 2-in. radius, this distance should be at least 2½ in. at the top.

Throat Sheet Brace.—The committee had the members submit designs of throat-sheet belly brace used and Fig. 10 shows 12 styles of braces, the design of brace for this location to be such as to avoid any mud pockets and so as to allow for proper circulation of water.

Method of Supporting Grate Side Frames.—The committee recommends the grate frames to be supported from studs in the mud ring or brackets fastened to the under side of the mud ring, the latter forming a pocket for the grate side frame to fit into.

Sloping Back Heads.—Sloping back heads are used by practically all of the members who replied to the circular. The

slope varies from 8 degs. to 20 degs., making an average slope of 12 degs. Sloping of back heads gives additional room in the cab, reduces the weight of the boiler and gives a maximum length of fixebox, and still remains within a reasonable limit for hand firing.

Staybolts.—Uniform spacing of all staybolts in all parts of the firebox is recommended by the committee. The majority of the members reported the use of button-head crown stays for the 6 to 9 center rows of the crown sheet the entire length; two members use hammered heads for the first 4 or 5 rows from the flue sheet.

The committee favors the use of button-heads on as many rows as the design of firebox will permit, but recommend for the consideration of members the practice of using hammered heads on the first 4 or 5 rows back from flue sheet.

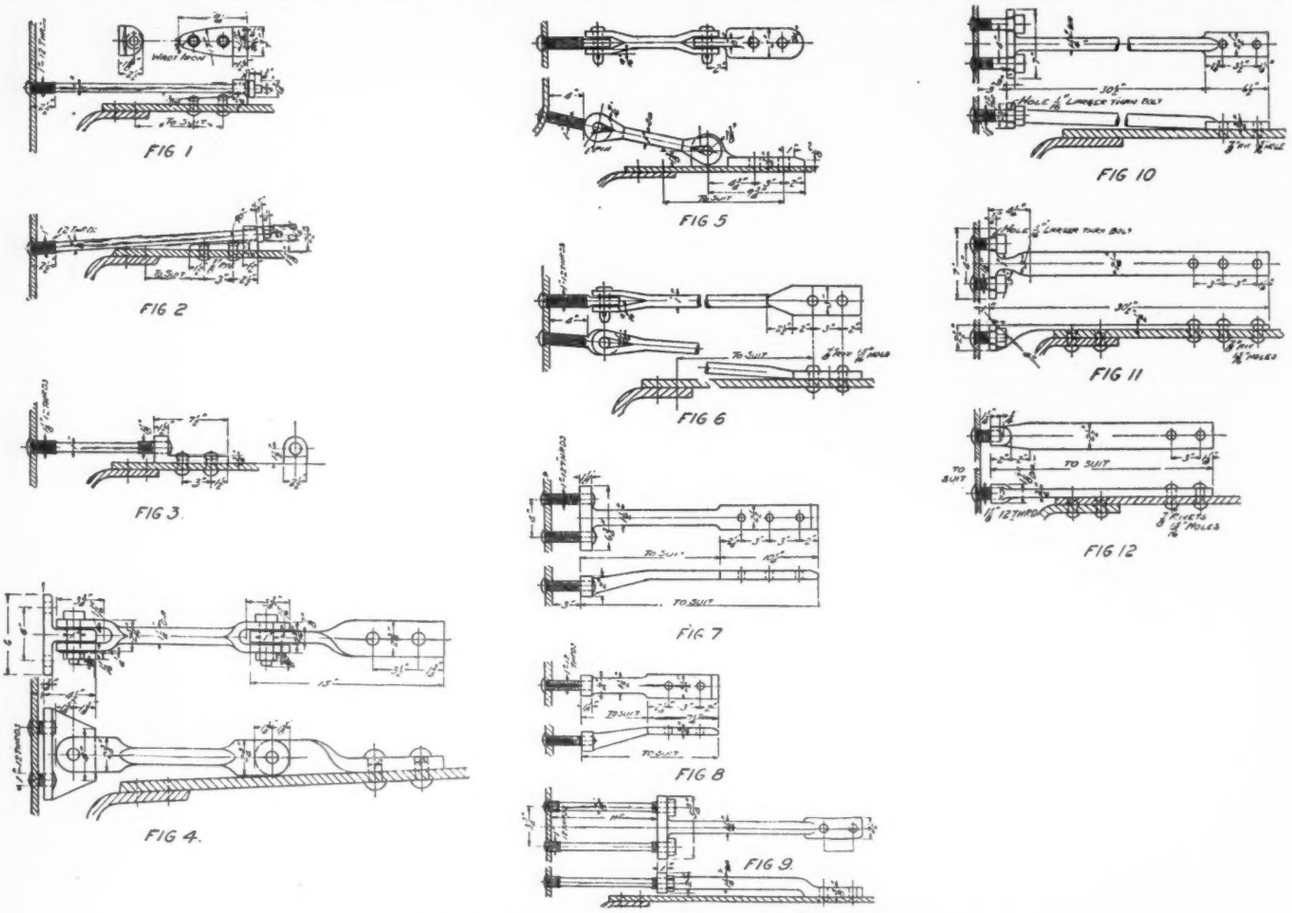


Fig. 10—Designs of Throat-Sheet Belly Brace.

Sling Stays.—Figs. 11 and 12 show the various types of sling stays in use by the different members and no difficulty with any of these types have been reported. Three members use a special flexible staybolt on all new equipment, and the use of this type of sling stays is also favored by, but not used by,

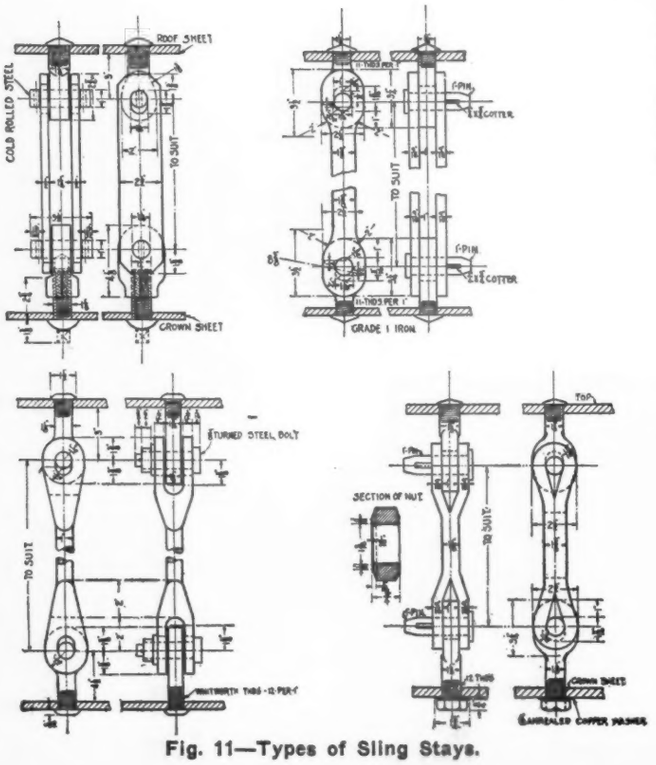


Fig. 11—Types of Sling Stays.

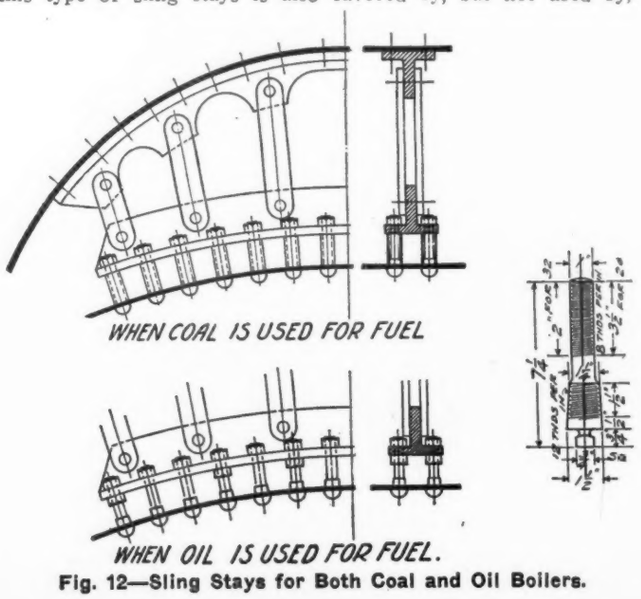


Fig. 12—Sling Stays for Both Coal and Oil Boilers.

another member. Sling stays are used to the extent of 2, 3 and 4 rows back from the tube sheet on boiler with combustion chamber.

Flexible Staybolts.—Of the members who have replied, all except one member use flexible staybolts. Most of the members apply these in the breakage zone. Five members are making full installation of flexible staybolts on boilers with wide fireboxes, and one member uses them in the throat sheet, only. One member has the following report to make:

"In February, 1907, engine received a new firebox with a full installation of flexible staybolts, with the exception of 4 bolts under the auxiliary dome and 4 under the steam turret; also 8 bolts which go on top at the back head. February, 1908, the engine received general repairs and the firebox was in good condition. All caps were removed from the flexible staybolts and they were found to be o. k. In April, 1909, it was found necessary to patch the top of the back tube sheet on account of the sheet cracking from the hole around the flange; this was done in the engine house. In October, 1909, the engine was given general repairs, and by this time the top of the back tube sheet had given out in two more places, but as the sheet was in good condition otherwise it was patched. Three of the mud-ring corners also had to have small patches applied. After rattling the scale from the firebox sheets with a large hammer, it was found that 40 of the flexible sleeves had cracked outside of the sheet, and on being taken out they were found to be crystallized, but no broken bolts were found. In 1911, the engine was again in the shop for general repairs and had all the caps removed from the flexible staybolts and the bolts found to be o. k. A patch was applied on the top flange of the flue sheet, but the half side sheet seam in the firebox was in good condition. When the engine is shopped again it will be necessary to renew the back flue sheet on account of its being patched. This engine has made 319,557 miles to November, 1911, and has lost no time due to broken staybolts."

One member advises that they have equipped some fireboxes with a full installation of flexible staybolts, but can see no advantage in doing this. In their opinion the flexible staybolts are only advantageous when applied in the breakage zone, and

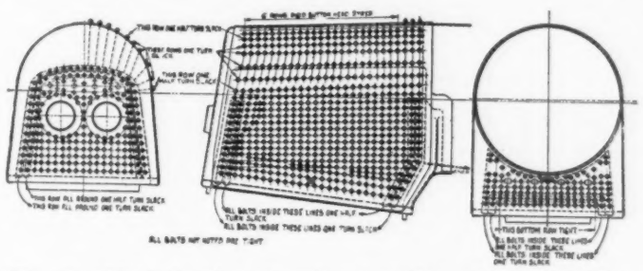


Fig. 13—Rivet Spacing Showing Location of Flexible Staybolts.

they have discontiuued making full installations and are only applying them in the breakage zone. However, a full installation of flexible staybolts in the throat sheet is being used by quite a few members with good results.

Three members advise that they allow a certain amount of slack when applying flexible staybolts. Fig. 13 shows the amount of slack and the location followed out by one of the members. It is the brief that an application of this kind will decrease the number of broken staybolts and allow for a greater expansion and contraction, which prevents the cracking of firebox sheets and increases the life of firebox correspondingly.

The committee believes that this is a subject worthy of further consideration and would suggest that some more of the members carry on a further investigation and make a report at some future date to this Association.

Tube.—It is the consensus of opinion of those reporting that 2-in. tubes are preferred, until the length of tube exceeds 16 ft., when 2¼-in. tubes are then preferred.

Taking into consideration that a 2-in. tube will give a greater amount of tube heating surface, and the cost of maintenance is less, and less damage is done to the tube sheets in working over the flues, the committee suggests that further consideration be given to the use of 2-in. tubes in lengths greater than 16 ft.

Thickness of Front Tube Sheet.—One-half inch and 5/8 in. are used by the majority of the members who replied to the circular. One member uses 9/16 in. and another ¾ in.

Thickness of Back Tube Sheet.—One-half inch tube sheets are being used by 16 of the members. Two members use 9/16 in. and one member uses 5/8 in. All but three report having more or less trouble with flue sheets working up on account of frequently working on the flues, causing the flue sheets to crack across the top of the flange of the sheet. One member reports that this trouble occurs only on the radial type fireboxes. The crown bar and Belpaire type never crack in this way. The top flanges get bent down on the two latter types, the same as in the radial type, but no cracking takes place. They have used eye bolts in crown sheet and roof sheet and sling braces between; also have a number of boilers equipped with flexible expansion stays in the first four rows across the front end of crown sheet, but there does not seem to be any method of bracing yet devised that will overcome this trouble. He suggested that the top of the flue sheet on radial type fireboxes be made straight across top for 24 in. each side of center and make front end of crown sheet conform to this shape.

Width of Bridges.—The width of bridge in the front tube sheet varies from ½ in. to 15/16 in. Three-fourths inch is used by the majority of the members. Width of bridge in the back tube sheet varies from 11/16 in. to 15/16 in. Three-fourths inch is used by the majority of the members.

Flue Setting.—Two members advise that they have tried out soft iron ferrules with very little success. One member advises that they had a limited experience trying to set flues in the back flue sheet without any coppers, but found that it did not work satisfactorily, and that they are now experimenting with a combined copper and iron ferrule, but have not had these under a test long enough to make any report. One member advises that they use soft iron shims on the front flues to avoid excessive expanding.

Setting of Flues in the Front Tube Sheet.—The consensus of opinion of the roads reporting is that tubes should be rolled in the front tube sheet without any ferrules, and 10 per cent. of the flues, equally distributed, should be beaded with a beading tool.

Tube Setting in Back Sheet.—Fig. 14 show the practice fol-

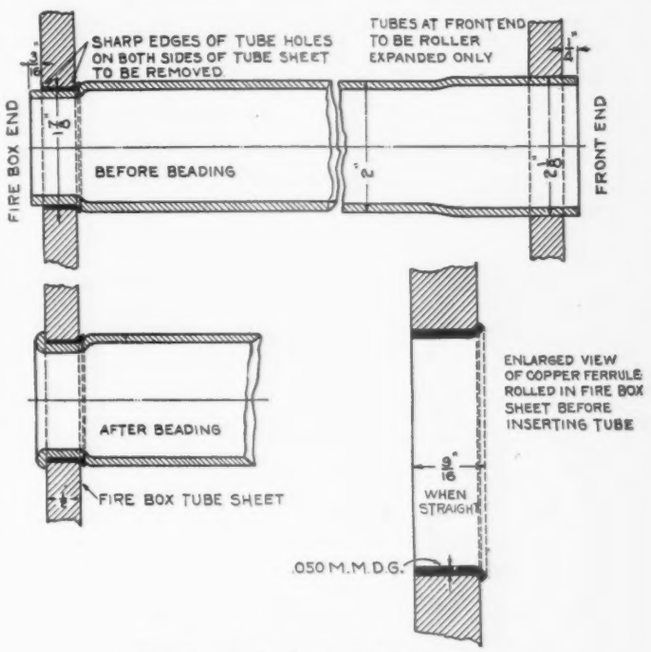

SHARP EDGES OF TUBE HOLES ON BOTH SIDES OF TUBE SHEET TO BE REMOVED
TUBES AT FRONT END TO BE ROLLER EXPANDED ONLY
FIRE BOX END
FRONT END
BEFORE BEADING
AFTER BEADING
FIRE BOX TUBE SHEET
ENLARGED VIEW OF COPPER FERRULE ROLLED IN FIRE BOX SHEET BEFORE INSERTING TUBE
WHEN STRAIGHT
.050 M.M.D.G.

Fig. 14—A Method of Setting. Flues.

lowed out by some of the members in setting the tubes, which are giving good results. Fig. 15 shows the application, maintenance and removal of flues in locomotive boilers as used by three members. Tube setting of this kind gives a large bridge, good circulation of water at the back tube sheet and at the same time the inside of the flue is reduced at the end, so that any cinders which will pass through the swedged end will not clog the flues. The instructions in connection with Fig. 15 are as follows:

Holes in the new firebox flue sheet shall be 1⅞ in. diameter. Holes in the new smokebox flue sheet shall be 2 1/32 in. diameter. Holes in an old flue sheet more than 1/32 in. out of round must be reamed (reamer Fig. 1). Inside and outside edges of the flue holes in both sheets must be slightly rounded to remove any sharp edges. The following is the method used:

Flue-sheet Holes (Fig. 1)—Care should be taken that holes in flue sheet are true, smooth and free from burrs and sharp edges. It is desirable that the flue hole have a fillet especially on the water side of about 1/32-in. radius. A sharp edge around the hole often cuts the ferrule in two, even cutting into the flue. The diameter of the flue hole should be the same as outside diameter of flue plus 1/32 in.

Copper Ferrule (Fig. 2)—For New York this should not be far different from No. 16 B. W. G. In old flue sheets when the flue holes are large it is desirable to use enough heavier ferrules to bring the internal diameter

of ferrule when expanded into flue sheet to ¼ in. less than flue diameter. The ferrule should be set into flue hole flush with fireside and expanded into place with Prosser expander, Fig. 3.

Swaging Flue (*Fig. 4*)—Great care should be taken to give the swage the right length and to have it terminate in as abrupt a shoulder as possible. The flue, after it is swaged, should be annealed and the scale removed from the portion entering the sheet. Grinding this scale off by machine is desirable, but in the absence of a grinder the removal of the scale with a file will answer. The flue when driven into the sheet (Fig. 5) should extend 3/16 in. through the sheet on the fire side.

Rolling (*Fig. 6*)—The front end of the flues having been shimmed, when necessary, both the back and front ends are rolled with the dudgeon or other suitable roller, with proper appliances they may be safely and economically rolled by air; the rolling of the back ends must be done by an experienced boilermaker, and the motor must not be larger than a Thor No. 22 or its equivalent.

Beading (*Fig. 7*)—This may now be done with a beading tool in an air hammer. Do as little hammering with the beading tool as possible, and do not work bead to a feather edge, but leave as much metal as possible for future caulking.

Expanding (*Fig. 8*)—Particular stress should be placed upon this, the most important step in the flue-setting process. Care should be taken that the flue shoulder when heavily expanded bears snugly and firmly against the flue sheet. Hammer not to exceed 4 lbs. after prossering the front ends, then bead a sufficient number for safety which finishes the flue setting. Back ends of flues or safe ends when used in back flue sheet must be cut off square in pipe machine and burr removed by reamer. Wheel-flue cutters must not be used on account of leaving a heavy burr which splits when beading over.

NOTE.—Air motor and roller are only to be used on initial setting. In reworking flues, the Prosser expander only is to be used, and rollers must not be used, as they force the bead away from the sheet.

Copper ferrules 1¾ in. inside diameter, ½ in. long, .095 in. in thickness shall be used in firebox flue sheet only. Ferrules shall be secured in place with straight expander, Fig. 2, taking care that shoulder of expander is tight against flue sheet, which shall bring edge of ferrule 1/32 in. from fire side of sheet.

Flue safe ends should be 5 in. in length, except that new iron flues shall have safe ends 4 in. long, and when these flues are first removed the 4-in. ends will be cut off completely and 6-in. ends applied, after which 5-in. ends should be used. Flues shall be swaged as per Fig. 4, to 1 11/16 in. outside diameter by 3 in. long, including taper at firebox end, for new work; for old work, just enough to enter the copper ferrule. All scale must be removed from swaged ends of flues before application. Smokebox end of flues shall not be more than 1/32 in. less in diameter than holes in the smokebox flue sheet. If necessary, liners may be used.

Flues shall be placed in back flue sheet with a bar, Fig. 5, and project ¼ in. through the sheet. Gage, Fig. 6, shall be used in checking location of flues. Flues shall then be fastened at firebox end with straight sectional expander, Fig. 7. While flue is being fastened it may be held in place at front end, using bar, Fig. 5. Straight sectional expander shall be checked with master gage, Fig. 8. Before using sectional expander, and in order to obtain exactly the proper length of flue for beading, flues may be rolled lightly to fasten them in sheet with roller expander, Fig. 15. After all flues are fastened they shall be flared at firebox end, using flaring tool, Fig. 9, and long stroke riveting hammer.

Flues at firebox end shall be expanded with sectional expander, Fig. 10, and long stroke riveting hammer. Roller expander must not be used. Pin shall be driven into expander until flue is solid against flue sheet. This must be done three times, expander to be slightly turned before each operation. The expanding shall be performed as follows: First, two vertical rows, from center to top of sheet. Second, same rows from center to bottom. Third, the two horizontal center rows from center to right. Fourth, same rows from center to left. Fifth, all remaining flues. All flues must be carefully inspected after expanding to assure that recess in each flue is the full depth to recess in expander and even all around the flue. Sectional expander, Fig. 10, to be checked with master gage, Fig. 11.

Flues in firebox flue sheet shall be beaded with standard beading tool, Fig. 12, and short stroke riveting hammer. Care must be taken so that nothing enters between head and flue sheet. Beading tool must conform accurately to master gage, Fig. 13, at all times. Smokebox end of flues shall be tightened with flaring tool, Fig. 14, before rolling takes place. All flues in smokebox end shall be rolled with roller expander, Fig. 15.

FLUE MAINTENANCE.

The firebox end of flues in service must be expanded at regular intervals with sectional expander, Fig. 10. This work shall be done when boiler is empty and all flues thoroughly cleaned out. Flue leaks in the firebox must be stopped with the sectional expander and not with roller expander nor beading tool. If beads are slightly away from flue sheet, standard beading tool shall be used to bring beads tight to sheet. Sectional expanders and beading tools must be kept standard by frequently comparing with standard gages. Any beading tool not conforming to gage must be sent to principal shop for repairs; these tools must not be repaired at any other shop. All shops and engine houses must be equipped with standard gages. All gages will be made where master gages are kept. To remove flues, use flue cutter, Fig. 16, for the front end, cutting off flues as close to the front flue sheet as possible. Back ends should be split as little as possible, so that it will not be necessary to use safe ends longer than 5 in.

Setting of Superheater Tubes.—Front Tube Sheet: Only eight members have had any experience with setting large superheater tubes. The practice followed out mostly is that

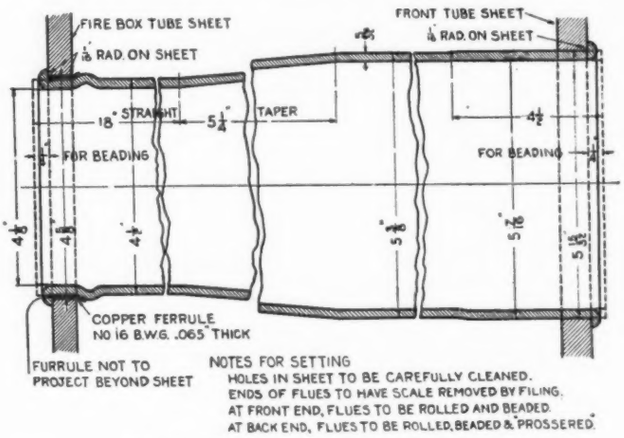

FIRE BOX TUBE SHEET
⅝ RAD. ON SHEET
FRONT TUBE SHEET
¼ RAD. ON SHEET
18" STRAIGHT
5¼" TAPER
4½
FOR BEADING
FOR BEADING
COPPER FERRULE
NO 16 B.W.G. .065" THICK
FURRULE NOT TO PROJECT BEYOND SHEET
NOTES FOR SETTING
HOLES IN SHEET TO BE CAREFULLY CLEANED.
ENDS OF FLUES TO HAVE SCALE REMOVED BY FILING.
AT FRONT END, FLUES TO BE ROLLED AND BEADED.
AT BACK END, FLUES TO BE ROLLED, BEADED & PROSSERED.

Fig. 16—Setting of Superheater Flues.

the tube is rolled and beaded as shown in Fig. 16, and this type of setting is suggested by the committee for further consideration.

Back Tube Sheet: Eight members advise that they use copper ferrules; one member who omitted copper ferrules is having good success with this method. The consensus of opinion of the roads reporting is that the type of setting shown in Fig.

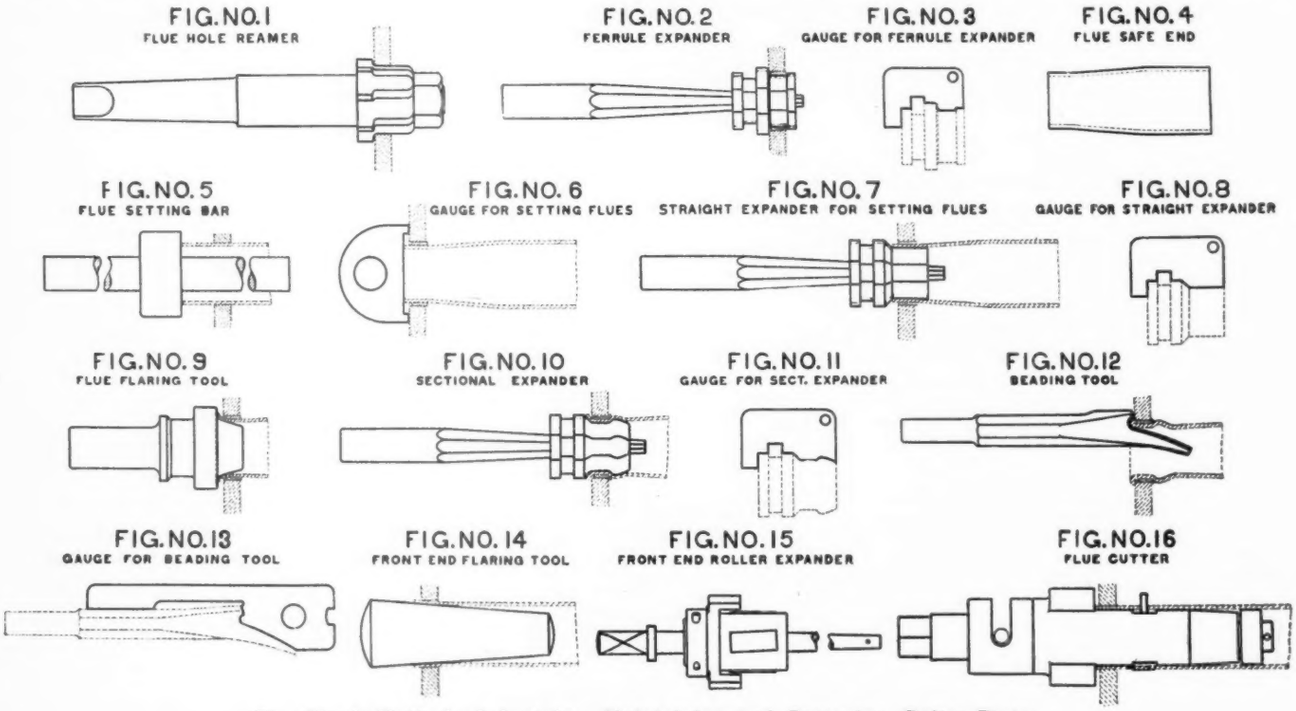


Fig. 15—A Method of Applying, Maintaining and Removing Boiler Flues.

16 is preferred, and the committee suggests this setting, except that the copper ferrules should be No. 13, .095 in. thick, instead of No. 16, .065 in. thick.

Circulation of Water.—The committee took up the question with the members whether any of them employed any special feature of design to facilitate circulation of water. It was found that no member has any special design for this purpose. Four members advise that they use baffle plates in the boiler shells, located ahead and rear of the dome. This is to prevent, as much as possible, the water from surging when making quick stops.

Seventeen members deliver the feed-water to the boiler in the first course on the horizontal center line. The distance from the front flue sheet varies; the minimum distance is 22 in. and the maximum 6 ft. Five members advise that they deliver feed-water to the boiler through the top as well as from the side. One of these members advises that they have never been able to find any particular improvement which the top check has over the side check. Two of these members prefer the water to be fed into the boiler from the top. Boilers having the checks on top of the boiler have a pan-shape deflector under the check valve which catches the water and prevents any direct stream of water falling on the top of the flues. One member advises that they deliver the feed-water in the first course on the horizontal center line and use a deflector plate placed a short distance away from the boiler course. This is to direct the water to the bottom without striking the tubes. Four members have an attachment on the inside of the injector check to deliver water upward away from the tubes. One member advises that in addition to circulating water from the horizontal line of the boiler they have some locomotives with the delivery pipe passing through the back head, extending from 3 ft. to 6 ft. from the front tube sheet, and the end of the pipe set to deliver water towards the side of the shell; the end of the pipe is submerged.

The committee has no recommendaton to make in regard to any particular location where the water is to be delivered to the boiler, as any of the above arrangements seem to give entire satisfaction.

Auxiliary Dome or Manhole Cover to Facilitate Interior Inspection of Boiler.—One member advises that they provide an auxiliary dome, or manhole, for interior inspection of boiler. The size of manhole is 15 in. in diameter, located a short distance ahead of the back flue sheet. This is submitted for consideration, as it makes inspection of the interior of the boiler possible without removing the throttle standpipe and dry pipe. One member of the Association is using larger dome in new construction to accomplish the same result.

Surface Blow-off Cocks.—Four members use surface blow-off cocks. One of these members has discontinued using them while the other two members, using surface blow-off cocks, have located them on a line with the second gage cock, and advise that they get good results from the use of both the blow-off cocks and surface blow-off cocks by getting rid of the mud and scale by blowing the boilers regularly. One of the members locates the surface cock on the left side of the boiler head just above crown sheet and is connected to a perforated pipe about 4 in. above crown sheet and extends to the front end of crown sheet and branches both ways to within 8 in. of sides of boiler and about 6 in. above flues. Perforated pipes lead from cross pipe nearly to front tube sheet. When properly used this device is of considerable value in cases of foaming. One of the members, who operates about 1,400 locomotives, advises that on certain engines in bad-water districts the Talmage type of blow-off is used.

The committee has no recommendation to make in regard to the number or where the blow-off cocks should be located. The number and location of blow-off cocks depends on the quality of water used.

Filling of Boilers.—One member advises that they have had a number of side sheets cracked by filling through blow-off cocks located in the water legs. They did not state whether they used cold or warm water. They are now filling through the blow-off cocks located in the barrel of the boiler. Another member advises that they have had considerable experience with sheets cracking from the filling through blow-off cocks with cold water. They now fill boilers through injectors when using cold water. It seems to be the censensus of opinion of the members that it is most advisable to fill the boilers from the blow-off cocks in the water leg, providing warm water is used. If cold water is used it should be filled through the valve on top of the boiler or through the injectors, and the committee recommends that this practice be followed out.

Washing Out and Filling Up of Locomotive Boilers.—The reports regarding washing out and filling up of locomotive boilers and the use of blow-off cocks were so at variance with what is generally considered good practice, the committee would strongly recommend the appointment of a special committee to report thereon.

Location of Fittings.—Gage cocks and lower column cock should be located so that they will not come directly back of gusset plate or stay angles, and not to be located directly over arch tubes.

The report is signed by D. R. MacBain (C. R. I. & P.) chairman; C. E. Chambers (C. of N. J.); T. W. Demarest (Penna.); F. H. Clark (B. & O.); R. E. Smith (A. C. L.); J. Snowden Bell and E. W. Pratt (C. & N. W.).

DISCUSSION.

F. F. Gaines (C. of Ga.): I think this is one of the most valuable reports that we have had submitted in a long time, and I am sure the association is under great obligations to the committee for their very thorough work. As regards the question of a large mud ring radius, it has been my experience that this is not altogether desirable. We have had some trouble with the large mud ring radius where we have not had it with the small one, and after having tried it we have gone back to the small radius. In regard to the question of arch tubes; I notice the general practice is to use tubes .18 in. thick. I would like to say that I have obtained better results from the .15 in. than I have from other types. Also concerning the radius of the flange in the back tube sheet; I found a smaller radius there gives better results, and after experimenting with a large radius, I have gone back to the small radius. I would also like to endorse the method of using sling stays referred to with the flexible arrangement. I also endorse the plate Z-1, as regards flue setting.

I also would like to call your attention to one other thing that there has not been much said on, in regard to the circulation of water. I find that, contrary to all theory on the subject, wide water legs in the fire box has not proven, according to all my tests and experiments, as good as the narrow water space, much better results being obtained from the narrow water space. In engines built exactly alike, in every respect, except one having a large water space, and the other a small water space, the small water space engine is a much freer steamer in every way. Of course, it is a little hard on the staybolts, but with the use of flexible staybolts, I think we are fully justified in using the smaller water space.

M. H. Haig (A. T. & S. F.): In the oil burning engines, a radial stay is being used which has a tapered head and no button head. It is screwed into the crown sheet within a short distance of the bottom of the tapered portion, and that end is then riveted over. The taper is 1⅜ in. in 12 in. The thread is 12 threads per inch (Whitworth standard). The oil burning service is a little harder on fire boxes than the coal burning service, and as this radial stay gives very satisfactory service in oil burning engines, there is every reason to believe it would be equally, if not more, satisfactory in coal burning locomotives.

It is the practice of one road that I know of, to apply 6 rows of button head stays at the center of the crown sheet for coal burning engines, and use the radial stay which I have explained, entirely on the oil burning fire boxes. I have referred to this radial stay and given these dimensions, as the matter was not included in the report of the committee. With regard to the mud ring, I also noticed that there was no reference in the report to a greater depth of mud ring immediately at the corners to provide for caulking. One railroad uses what you might call a heavy boss at each corner, which is about ¾ in. thicker than the remainder of the mud ring.

Reference is also made in the report to the O'Connor type of fire-box door. The road by which I am employed has applied that arrangement on all engines that have been built in the last few years, and it has given very satisfactory service. A request for information as to the performance of this door on the various divisions of the system has resulted in reports that the performance is very favorable. With regard to the large dome to facilitate entrance to the boiler to permit inspection, in my opinion it is a very commendable recommendation. In practice, the boiler inspection rule requires that the throttle must be removed, or that the information be given that an inspection is being made, as far as possible, without removing the throttle. If domes are made large enough to facilitate entering the boiler conveniently, I think that is a point which could be well taken up, to advantage. I mention that for the reason that rule has caused some confusion in certain districts with which I have been associated, and some of the boiler inspectors are not just fair as to how they shall make the report, and the Government inspectors are rather strong on that. I think that point could also be looked into with good advantage.

D. P. Kellogg (S. P.): We are using the same style of radial stay that Mr. Haig referred to, with good results, except that we use 1½ in. taper. We go a little further and use a thimble on the crown bar bolt, which goes up against the crown bar and eliminates the necessity of caulking into the crown

bolt. Lately we have been applying that without riveting, simply depending on the taper, and we have got good results.

The report speaks of the difficulty experienced from the flue sheet travelng up by reason of the expansion of the flues. In putting in a new fire-box we drop the crown sheet down, and try to make it half the distance we expect it to rise in service, thus dividing the amount of travel, giving it half the amount to start with, and allowing for the other half to bring it to slightly above the straight position.

W. E. Dunham (C. & N. W.): The committee mentions the .18 in. arch tubes. We have been doing some experimenting, using a No. 7 gage and a No. 10 gage arch tubes, both iron and steel tubes, but in the bad water districts of Minnesota and Dakota we find there is not much material difference in the two gages of tubes. The greatest trouble there, especially in South Dakota, is to keep the water in the tube. I do not just understand the reference where the committee makes a reference to the radius of the flange in the back tube sheet, and that 2 members had increased the radius from 7/8 in. to 2 in., and then have gone back to the 7/8 in. It would seem from reading the report that there was an improvement made by going to the 2 in. over the 7/8 in radius, and I do not quite understand why the members referred to should have returned to the use of the 7/8 in. radius.

In regard to the matter of radial stays with the button head: The committee seems to indicate that the use of hammered heads in the central rows at the top are not general. We considered that the use of the hammered head, especially at the forward end of the box, was entirely a matter of safety and ought to be generally used. In connection with the Federal inspection of the domes and inspection of the stays on the front flue sheet, I see that there is no recommendation brought out on that point, although the report mentions the use of an auxiliary dome or a manhole for the inspection of the boiler. That possibly could be taken care of. I have been thinking of locating an especially large water-washing plug near the front flue sheet, and at the top of some of our small boilers so that we can observe these stays.

Mr. Gaines: In reply to Mr. Dunham, I would like to say that the reason from going from the larger radius flue sheet to the smaller radius flue sheet was due to the trouble we had with the larger flue sheet cracking and breaking. Our experience showed that the smaller radius gives very much less trouble in this respect than the larger radius.

J. F. DeVoy (C. M. & St. P.): So far as my personal opinion is concerned, the report is about the best I have ever seen. I do not understand exactly now, even after Mr. Gaines has explained it, why he went to the smaller radius sheets, other than transferring the expansion which you naturally get in the large radius, back to the location between the rivets and the first sling-stay. It would simply transfer the expansion from one to the other and it might relieve the cracking in that way. With regard to what another member said relative to oil burning boilers receiving harder service than coal burning boilers, that is not our experience in the past year. In our first oil burning engines we did not protect the seams and the rivets. For the past year we have covered all the seams and all the rivets with brick so that there is not anything which is any more severe on the fire-box than there was in the coal burning locomotive, and the only suggestion that occurred to me in reading this report was possibly the fact that later on the committee could designate in some way a standard method of protecting an oil burning fire-box by the proper location of brick.

There is only one thing in regard to sling-stays in an oil burning locomotive; it is the button head. On the Chicago, Milwaukee & St. Paul we use a copper washer, only on the coal burning locomotive, and we still find that in our territory this is as good as any other method. In oil burning locomotives the button head is used altogether. I would like to see some attention given here to the distance from the belly of the boiler to the lower point of the mud ring.

W. J. Tollerton (C. R. I. & P.): I would like to call attention to Fig. 5; the scarfing of the seams and riveting the seams. We have been operating the scarfing of riveted seams for about 4 years, and we know that it does eliminate the flange cracking from rivet holes. By scarfing the seam down ½ the thickness, we have been able to run sheets 18 months without cracking at the rivet holes, and I believe it is a great advantage.

Mr. DeVoy: I want it understood that my remark as to the riveting of seams was directed entirely to oil burning locomotives, of which we have about 150, and did not in any way refer to a coal burning boiler.

S. L. Bean (A. C. L.): Concerning oil burning engines, I might say that we used the submerged seams with the present door sheet. As to the flue sheet, we tried the submerged for a short time, and it worked fine; but we have to work the flues so hard that a vertical expansion takes place, and as it goes up you encounter a greater defect. Your crown sheet cracks right across, immediately back of the flue sheet. With the door sheet it works fine where there is no working of flues to disturb it and it helps it wonderfully. One of the gentlemen spoke with reference to putting on some brick. That helps it, but it is desirable to get away from it, and we only use that to prolong weak boxes. We find that the button head stays will peel off in a year or so. We invented this taper head and slightly riveted it over, and now they last practically the life of the box without renewal. Occasionally we do have to renew some of them. We have extended the oil burning firebox period of service from about 18 months to a record as high as 7 years in heavy consolidation locomotives used in mountain service and in a bad water district. And I am free to recommend that taper radial stay. It will surely hold under all conditions, and I don't think it costs any more to apply than the button head. I think Mr. Kellogg will bear with me on that.

With reference to the doing away with the large flange in the flue sheet or bend, we find with a short bend that the metal was somewhat disturbed and a pitting took place much quicker. We also found that with the thimbles under these crown bars, the forward end pit immediately under the thimbles and destroyed the life of the firebox. We took them out and now find we prolong our boxes a great deal by patching. There is where the seam brick comes in pretty well. You can patch the top flange of a flue sheet with a submerged patch, and by using a light seam brick we sometimes get over a year's increased service at a slight expense.

E. W. Pratt (C. & N. W.): I would like to ask Mr. Bean if they use a thimble under the crown bars on their oil burning locomotives.

Mr. Bean: Three in each row. We do that in order to keep away from that burning.

J. A. Pilcher (N. & W.): I wish to say in connection with the matter of construction that we have been making some experiments with every wide water space, as much as 7 in., and it has been very favorable. We have been using it now for several years and applied it to something like 250 locomotives, and I understand from the reports that we have been getting, that it has decreased the stay-bolt renewal as well as increasing the circulation, and keeping the boilers clean around the mud ring. Of course, like most boilers on large locomotives, we have had some trouble in getting all of the depth to the front leg of the firebox that we would like. It seems to me the increase of the water space has been entirely favorable.

Mr. Gaines: I would like to ask some of the members who have had experience with oil burning locomotives, about how soon we should look for trouble when a coal burning engine has been changed to oil burning.

Mr. Kellogg: I will answer Mr. Gaines, that he will have no trouble until he gets out the button head that Mr. DeVoy said he was using already. I cannot use it. I would say that this method of reducing the flange is also very necessary. We want nothing projecting inside of an oil burning firebox that can possibly be prevented.

Mr. DeVoy: I absolutely agree with the last speaker, and perhaps he was mistaken. You cannot have anything projecting at all. We countersink all the rivets and the flange stay, as referred to here, with the taper, and a slight button head is what we use, getting away from as much projection as possible everywhere; so that in order not to confuse between our standard practice of the Chicago, Milwaukee & St. Paul, I call the other the button head. So, I thoroughly agree with you in that. There is but one way to do any transferring from a coal burning to an oil burning firebox; put on a piece of brick just as soon as possible. You can patch it just as easy as you can a coal burning boiler. And apply the brick to it and you won't have any trouble at all. It will repay you for many a failure.

W. J. Tollerton (C. R. I. & P.): I may say for Mr. Gaines' information, that you will have very little trouble with your sheets cracking behind your brick. The cracking will occur above the brick, and you will have much better satisfaction if you slip your brick out slightly outward; even on a vertical sheet it has a tendency to keep the brick in place. A little broken glass thrown on top of the brick will help you very much in your performance.

A. G. Trumbull (Erie): Our practices are very well covered by the report of the committee. However, I should say in regard to Fig. 10, that many of these stays have been submitted by railways that have very good water conditions.

The second one, for instance, could hardly have been better designed as a mud-catcher, if that had been the aim. We have used with considerable success the type of throat sheet stay shown on Plate T-1 of the Supplemental report, our idea being that it was rather incongruous to attempt to resist the influence of expansion by the use of a collared stay, and, as far as my observation goes, we have not had a single case of cracked

flue sheet where the crack is of any length, since we commenced to use a particular type of stay. I have been also interested in the standard method of setting flues as illustrated in Fig. 15, and it seems to me we might very well dispense with the flue-flaring tool and utilize, instead, the sectional expander which, as illustrated here, will answer every purpose in setting the flue, and also in turning the end of the flue over, so that it can be properly beaded. I also think we can very well use the sectional expander, instead of the ferrule expander here illustrated, thereby reducing the number of tools, and consequently the maintenance, and possibly enable us to follow up the practices in engine houses much better than we could with the number of tools that are here illustrated.

Mr. Pratt: As a member of this committee, I am of the impression that there was no report made by any of the members concerning the service of the Jacob Shupert fire-box or its design, and that is the way I can account for its omission in this report. This report is a résumé of the reports of the different railways that took the pains to give the committee the information they desired. I think it would well pay the designers of boilers to consider the suggestion of the committee with regard to length of flues, wherein it is rather modestly stated that the lengths of over 16 ft. be given careful consideration and when we obtain Prof. Goss's report of his evaporation efficiencies, as between the fire-box and the flues, I believe that that will even be more strongly brought to our notice. It is apparent from his preliminary report that the fire-box evaporation is from 50 to 54 per cent. of the entire boiler evaporation. Therefore, it may not be that there is very much obtained by the few feet additional length on the front of the flue, while there would be a great deal gained apparently by an increase in the fire-box by using the combustion chamber. I may not be correct, but it is my impression that more of the railways are doing away with the two holes than are going to the double fire doors.

Relative to the thickness of arch tubes, I believe the water conditions have more to do with the results obtained by the different members, one getting the best results from a heavy arch tube, and another with a light arch tube. On the Chicago & Northwestern road, where we have some pretty poor water and some divisions with treated water and pretty good water, we have found that in the latter case they recommended the light arch tubes, while in the poor water district they preferred the heavy arch tubes, and got better mileage out of it. We experimented with several locomotives making a gage or tram to indicate the upward movement of the top of the flange of the back flue sheet, due to repeated expansion, and in a locomotive with about 400 flues, I don't remember the diameter of the shell, we found that the top flanges of the flue sheet moved upward from 5/8 in. to 3/4 in. during a year, with expansions approximately once every month. We tried the O'Connor fire-door flanges out very thoroughly before we adopted it as standard on the Northwestern, running engines with and without it in the same districts, especially poor water districts, and I found it to be quite an advantage. We have over 1,200 locomotives just equipped. In fact, we have nearly as many locomotives equipped with the O'Connor flange on the Northwestern roads as on all the other roads in the country combined. But the reports in the extremely bad water districts in the southwest and the extremely good water districts, where the trouble with the doors and door sheets was due to expansion and contraction, appears to be about the same. In applying this door to a new design where the staybolts are laid out as we would suggest, the nearest bolt on the door sheet side is from 7¼ in. to 8 in. from the edge of the door hole, which gives a much better expansion and contraction. We are new in the oil-burning business; we have less than 50 locomotives at present, equipped for burning oil; but we find that with the front-end burners, as they are being used by most of the oil-burning roads, the flame strikes the door sheet and gives more trouble than with the coal burning engines. With the expansion and contraction that is permitted in these door sheets, by means of this flange, the door lasts very much better than the ordinary type of door. In fact, we find that the large proportion of our engines that are in the boiler shop are receiving new flue sheets and side sheets and the door sheets require no attention whatever, either about the flange or about any part of the door sheet.

F. J. Harrison (B. R. & P.): I would like to ask the gentleman who has just spoken if he found any accumulation of mud about this door sheet?

Mr. Pratt: We did not. There appears to be a much better circulation around the door on account of the greatly enlarged water space, and more particularly because the staybolts are far away from the door; but I believe it is proper to put a wash-out plug above any door. We know there is more or less scale that falls down there and it is quite a distance from the wash-out plugs which go above the crown sheet, and it would be found quite an advantage to have a wash-out hole above any door, to wash it out.

Angus Sinclair: Taking the substance of all the reports on boiler construction that have been presented to this association, I think that this is the best one I have ever examined, and I think it is very creditable to the committee that they have made a synopsis of the whole tendency of progress in boiler construction, and everything that they have recommended seems to be in the right direction.

D. P. Kellogg (S. P.): To prevent accidents due to low water in the boiler we have endeavored to perfect an apparatus, which has proven satisfactory so far. It is operated by a difference in temperature, which is secured by entrapped water in a cup, and partially cooled to about 50 degs. lower in temperature than the water in the boiler. When the water falls to any prescribed limit, the man in charge of the locomotive sees the danger line, or steam enters and expands the mercury in the device which opens a steam valve, and causes an audible alarm, or controls the fire. In the case of an oil burning locomotive, it shuts off the fuel supply, and in the case of a coal burning locomotive it sprays the fire with a jet of water. There are about 40 of these devices in use on the Southern Pacific. At the present time they have proved quite satisfactory, and it is our expectation we will extend the application of them to a very large extent.

J. Snowden Bell: As a member of the committee, in considering the replies that were received from the roads to our circular of inquiry, I was surprised and disappointed at the comparatively little amount of information which we received on the subject of combustion chambers. Now, in view of the admitted superior evaporative efficiency of fire-boxes and heating surfaces, and the ability to attain it by the use of the combustion chamber, it has always seemed to me very desirable that they should be adopted unless there is some good reason to the contrary.

M. H. Haig (A. T. & S. F.): Most of the discussion has centered on the construction of the boiler. At the same time there has been more or less discussion during the entire convention with regard to economies. There is some reference in the report to the method of delivering feed water and I will refer to one arrangement by which water is delivered to a perforated pipe connected to each boiler check. the water coming out of these various perforations in the pipe falls on a plate above the tubes, and the claim is that cold water does not settle so readily at the back of the tubes. I would like to ask some of the members for an expression of experience with regard to that method of delivering feed water. One of these devices was placed on an engine on a western road 6 or 8 months ago, and the only report given so far was from one of the road foremen engines who has been following this engine. His claim is that the engine uses less fuel and less water, and at the same time he states there is a greater tendency for water to be lifted to the throttle. That latter feature, however, is a shortcoming that no doubt can be overcome.

C. E. Chambers (C. of N. J.): Mr. Bell raised the question of absence of information concerning combustion chambers. I presume all anthracite roads, nearly all, at any rate, at one time all used combustion chambers on their engines. There is no doubt at all as to the efficiency of such chambers in aiding combustion, and the aid to the steaming of the engine which follows when the combustion chamber is in good shape, thoroughly clean and the flues clean. However, the use of the combustion chamber means the drawing of the fire at least once a week, and the cleaning out of ashes accumulated behind the brick wall, and the boring out of several of the bottom rows of flues which naturally block up. There is another condition against it, it reduces the number of flues in the boiler, and we also naturally have a small circulation space between the bottom of the combustion chamber and the boiler shell. This requires close watching, if the water is at all bad, to keep it from blocking up. Eliminating these arguments against the combustion chamber, there is no question at all about the good you get from it, so that, after all, it is simply a matter of the conditions that will govern whether you will or will not have a combustion chamber.

A few years ago we changed from the combustion chamber, in several types of locomotives, when we were making renewals of the firebox, to the D-flue sheet type. We also had a number of boilers built with straight flue sheets, and as the boilers required new tubes, flue sheets, or throat sheets, we applied the D sheet, because of the short life we got from the straight flue sheet and the shallow firebox. I find an increase in the life of the D sheet of as much as 40 per cent.

I think Mr. Trumbull made some mention as to the number of tools we have designated for the purpose of applying the various sheets to the boiler. We, of course, attempted to indicate what we considered was good practice. My experience with the average engine house is that if you let the machinist

have his own way, his kit of tools wil consist of a pinch bar, a hammer, and a chisel, and we have designated here what we think is good practice, and have defined the use of suitable tools for the different purposes provided.

One of the members spoke of going to the extent of 7 in. in the water space in the legs of boilers. I do not know how long he has used that space, or how closely he has watched the operation of it, but it seems to me you get a very sluggish boiler with 7-in. water space, and while it may not plug up, I cannot agree to the efficiency of such a spacing. My idea is, and always has been, to use as little space as possible, and keep it clean, if you want to get a good and efficient boiler. As to the scarfing of seams in firebox sheets, that has been tested out very thoroughly on the Central of New Jersey, and, in our opinion, there is no question about the good results obtained.

F. F. Gaines (C. of Ga.): In reply to Mr. Bell would say that my experience originally with the combustion chamber is very similar to that of Mr. Chambers. At one time I was in the anthracite district and was pretty well acquainted with the combustion chamber as it then existed. I have been a little hesitant about saying much about the thing but I would like to refer to Fig. 2 of the report and answer some of the objections Mr. Chambers has made to the combustion chamber and show that these can be overcome. For instance, you can completely remove at any time, any sediment, sparks, etc., deposited in the combustion chamber. You also get rid of the water legs, but do not cut down the number of flues. I would further say that there is an absolute coal economy of about 15 per cent., which was determined on very carefully and thoroughly conducted tests. I would also say that in the matter of flue economy, it is very much more than that. Engines in the district where the first engine was equipped with this combustion chamber, ordinarily make about 25,000 to 30,000 miles, and the first engine so equipped has now made over 110,000 miles, and during the time that it has been making this mileage, we have not had a request from the engineer to blow the flues. The engine has been in the shop twice for tire turning and the flues were examined and probably blown out, but the flues have not been blown out in the engine house, as far as I have been able to ascertain.

It also does another thing, with the soft coal engine it would not be so noticeable as with an anthracite engine, but it eliminates to a large extent, sparks and smoke. An engine with this device properly applied will not emit any black smoke, and but a minimum of brown smoke, and the sparks are noticeably absent. The amount of cinders found in the front end is about 25 per cent. of what you find in the ordinary engine, although we are using in the front end what you would style a self-cleaning front end.

We also found in our short experience, not enough to pass on the matter definitely, as we have only had the superheater engines in connection with the combustion chambers for 6 weeks, and have not found it necessary to blow out the superheater flues, that there is very little trouble with the flues. We have yet to find any indication of these flues stopping up or giving trouble, as they have done in many cases when soft coal is used. In regard to the question of the maintenance, the fact that the engine has made this large mileage as against the ordinary mileage, answers that point thoroughly. We also got rid of another point Mr. Chambers referred to; that is the multiplicity of seams due to the ordinary type of combustion chamber; you have no more seams than with the rest of the fire-box; you simply have a longer fire-box, which gives a greater fire-box heating surface.

D. H. Deeter (P. & R.): When we first started in designing the wide fire-box we had the old sloping baffle sheet at the top. After having 75 of these locomotives, we found with the amount of service that was required of the engines, they would not carry the water properly. Our combustion chambers were 22 in. in length at that time. The depth from the bottom of the combustion chamber to the bottom of the barrel at the throat sheet was about 7 in. We had tried various sizes of flanges at the throat sheet from 1½ in. up to 3 in., but mud would collect at that point. We had quite a little trouble with the bottom of the combustion chamber becoming blistered and burning out, and in 2 or 3 years becoming detached. By removing about 8 of the flues every 6 months or a year, in addition to 2 or 3 of the bars, that trouble was all eliminated. This is a small matter compared with the amount of saving of fuel.

After trying these engines for about 15 years, we put on the straight wrapper sheets, and found that we could carry our water more easily and steadily over the road, also obtaining better circulation. Now, in my estimation, if we could lower the depth of the sheet three or four inches more than it is it would be an advantage, as Mr. Gaines says, but from the fact of the construction of the wide fire-box, it is really impossible to go down any further than we are now, from the fact that you cannot get rid of the ashes so readily. They seem to clog up along the side.

Regarding the trouble with the bottom flues in these combustion chambers, we are losing sight of the fact that it is not altogether on account of the construction. Years ago it was very seldom that we would remove the flues. A good deal of the trouble can be laid to the fireman. In previous days he was more careful and we should teach the fireman to properly fire his engine. Furthermore, we have found that the fireman is more or less anxious to fire with both fire doors open at one time, which is very hard on the fire-box. We have cases where we do not clean out our combustion chambers on our fast freight engines once in 2 weeks, but on our high-speed locomotives we are really compelled, as Mr. Chambers says, to clean out the chambers twice a week.

We find that a 2 in. flue is the most serviceable flue that we can have for a wide fire-box locomotive with a combustion chamber. We have tried all sizes of flues, from 1¼ in. to 2½ in. We changed from the combustion chamber about 10 years ago on our D-5 engines to what we term a combination flue sheet. In my experience in handling these engines I found our principal difficulty was to keep these combination sheets stayed properly at the bottom or close to the firing line. The life of these combination sheets ranges from about 2½ years to 4 years. We have discarded quite a few of them and gone back to the combustion chamber, and I find the combustion chamber is economical as to fuel and the life of the fire-box is about 8 years as compared to 4 years in the case of the straight sheet.

Mr. Chambers: For fear that the members may think from the remarks I made that we have discontinued entirely the combustion chamber, I wish to say that at the present time we are building engines both with the combustion chamber and without, largely governed by the service they are going into.

F. T. Slayton (Virginian): I should like to ask if any member present has had experience with the welding of flues to the flue sheet. Several speakers have referred to the growing of the flue sheets, that is, the expanding of the flue sheet in an upward direction, which must be due to rapid working of the flues, with Prosser and roller tools, which not only has a tendency to cause cracking of sheets, but must necessarily take the pressure off the first staybolts next to the seams, thus transferring the load to the next row of stays, and so on, thus doing away really with the use of the first row or rows of stays. It seems to me that if we could avoid this excessive working of flues, we would overcome that trouble.

I understand some of our members have had experience with welding in flues for a year or more. I recently made a test of this kind which has proven very favorable thus far, but I do not know what I am going to run up against later. About 3½ months ago, I took an engine which was in service, where it was compelled to take brackish water entirely from one tank, and had extremely hard service on account of pushing cars over a hump, and then drifting into a yard where it was worked to its full capacity for probably 30 minutes, then drifting around for an hour. The engine got into such shape that it was necessary to "kill" it prac. tically every day to work the flues. The engine was supposed to work day and night. We welded in the flues and since that time we have had no trouble whatever. This was an engine in which the flues were all set in the regular way, and the welding-in simply consisted in sealing the joint between the bead and the flue sheet. By making some experiments with a section of flue sheet with the same welding process, we found we could get a better job by simply letting the tube project through the sheet, the same as for rolling and beading, and then fill in between the end of the tube and the flue sheet, at an angle of about 45 degs. It made a neater job. We also tried belling out the end of the flue and welding in a similar way, but found there was a tendency to burn off the edges of the end of the tube, and that we could get a better job by allowing the tube to extend through straight. This engine is now in the shop for general overhauling, but we are not removing the flues, as they did not give us any trouble, and we wish to continue the experiment.

I next welded in the flues of a Mikado engine having a tractive effort of 55,900 lb., hauling 100-car trains of 7,600 tons in regular service, and welded the flues as well as the fire-box seams of this engine. This engine remained in that service until about a month ago when it was put in lighter service on the mountain, and the engine comes to the terminals only for wash-outs. This engine has given no trouble from leaks in the fire-box, although previous to the welding of the tubes we had had considerable trouble from leaky tubes. In the case of the road engine, there were also about

40 fire cracks in flanges or sheets which were welded successfully.

Thos. Roope (C. B. & Q.): We have only one class of power in which we have welded our flues and that is the Mallet, equipped with double boilers. When we discontinued using the hot boiler and feed water heater and obtained steam from both boilers, we found it necessary to weld the top flues in the front boilers. We were not able to keep them tight in any other way. The engine has been running now for about one year, and up to the present time has been successful.

C. A. Seley (C. R. I. & P.): I do not believe that this committee should be criticised at all for matters omitted from the report. They have given a compendium of information of great practical value of the practice of the railroads in regard to the design and use of boilers, as contained in the responses to the committee's circular of inquiry, which was very voluminous, as members will remember, no doubt, and the committee has framed up a very useful and valuable report. I think we are exceptionally fortunate in having this report for our proceedings, and as a guide in our practice.

Prof. W. F. M. Goss: I have prepared no discussion of this paper, although it is one which interests me very much. I am impressed both with the report of the committee and with the discussion that has been based upon it, with the fact that in very many matters of detail entering into the construction of a steam boiler, much depends upon related details, and it seems to me that the conclusions of the various members of the association responding to the requests of the committee for information, need to be very carefully analyzed before they are in all cases safe as guides to practice. I think the one statement which has been brought out in this discussion, which interested me most, is that of Mr. Gaines, and some others, which seems to advocate a narrowing of the water legs of the boiler. I had rather the feeling that progress in the design of locomotive boilers during the last 15 or 20 years had been expressed as much by a tendency to give greater width to the water legs as by any other tendency, and so I must confess to a great deal of surprise to find there are some who feel that that movement has been carried too far.

Of course, our problems in locomotive design and maintenance change from year to year as practice leads us into new fields. If we look back into the development of the last 25 years, we shall have ample evidence of that fact. When our boilers were small, most of the railways were using the crown bar form of construction, and to my mind that form of construction is necessarily associated with the small boiler of a good many years ago. There is no chance, as it seems to me, to enter into a discussion of the crown-bar type as applied to our modern large boilers. We continued in the use of the crown bar until the forces to be sustained by the crown bar became too great for satisfactory treatment through that form of design, and then we went to another form, the radial stay, and between, perhaps, the crown bar and the full fruition of the radial stay, came the Belpaire boiler, and I take it that the railways for many years past, the past decade anyway, have been devoting themselves pretty largely to the perfection of the radial-stay, type of boiler, and the result is a highly perfected design, in the perfection of details of which we are pretty largely engaged at the present time.

But now the radial stay boiler has grown to dimensions undreamed of over 10 years ago in general locomotive practice, and there is no doubt in my mind but the radial stay boiler is going to continue to grow, and that fire-boxes will, in one form or another, continue to increase in size, and what are the problems of the future with reference to such a possible development? That is the large question to look forward to in considering the tendencies in locomotive boiler design, and keeping that in mind it seems to me that some of the propositions which are now being put forth, especially that which has been referred to as represented by the Jacobs-Shupert type of boiler becomes, in the light of possibility of future practice, and of the increasing demands of every-day practice, a matter of very great significance and interest.

G. H. Baker: I wish that the committee could be continued, or that another committee should take up a branch of the subject which has not been dwelt on in the present report. After a boiler is constructed, it must be operated. During the 20 years I have been a member of this association, there has never been a committee, I believe, that considered the subject of the management of locomotive boilers and their operation, although two of the speakers here this morning, have brought in the importance of the human element—the engineman and the fireman.

F. F. Gaines: I move that the discussion be closed, and I would also like to move the suggestion relative to washing out and cleaning locomotive boilers. I think that is a good subject.

E. W. Pratt: It seems as though it would be in line with the recommendation of the committee, if the new work of the committee could be outlined as suggested by Mr. Baker, as well, and perhaps the title of the work which the committee would report on would be operation, maintenance and repairs of locomotive boilers.

The motion was carried with the amendment.

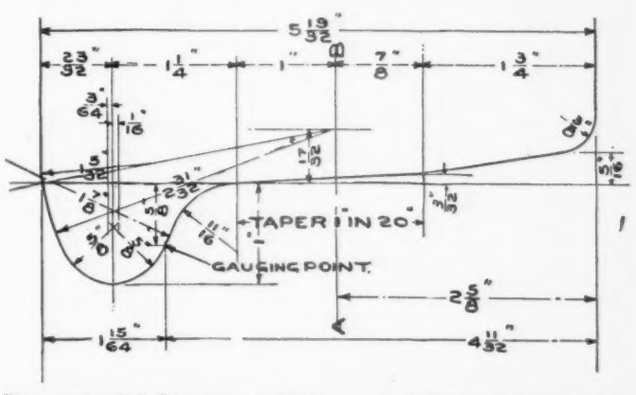
CONTOUR OF TIRES.

The committee on contour of tires has been instructed to look into the various points brought out in the discussion at the last convention and, if possible, recommend a contour of tire that would be most economical in all services; also, recommend a minimum thickness of flange for re-turned tires. The discussion at the 1911 convention was confined to the proposed reduction in height of flange from 1⅛ in. to 1 in., the taper of tread, and the question of limit of flange thickness of less than 15/16-in.

After considering the replies received to a circular of inquiry and such other data as were available, the committee is very

W. C. A. HENRY,
Chairman, Committee on Contour of Tires.

strongly of the opinion that the M. C. B. recommended contour of tread and flange for steel wheels should be used for engine and tender truck wheels. To a very large extent in ordering wheels it is not specified whether for tender trucks or cars, no distinction being made as between the two. It is of distinct advantage to the railways to keep down the number of standards manufactured as insuring more prompt filling of orders and a smaller stock on hand at their own ships. The



Recommended Contour of Engine and Tender Wheel Treads.

committee, therefore, recommends for engine and tender truck wheels in all classes of service the contour of tread and flange as shown in the accompanying illustration. This contour is the same as will be recommended to the M. C. B. Association in June, 1912, and differs from the present M. C. B. recommended contour in that additional metal has been added to the back of the flange, making the contour of the flange identical

with the flange for cast-iron wheels. This thickening of the flange was recommended with the view of increasing the life of the wheel, as many steel wheels are now withdrawn from service due to thin flange. Replies received from the manufacturers of steel wheels indicate that about 80 per cent. of the engine truck and 95 per cent. of the tender truck wheels manufactured during the past year are of the 1909 M. C. B. recommended contour.

In driving-wheel service the conditions are somewhat different, as the brake shoes generally used are recessed for the flange, and also opposite that part of the tread coming in contact with the rail. This tends to keep down the height of flanges and retards channeling of tread. On account of the general opposition to any reduction in flange height of driving wheels in road service and the fact that the present A. R. M. M. A. standard contour of tread is so nearly like the M. C. B. 1909 contour, the committee does not feel justified in recommending, at the present time, any change from the present contour, for driving and trailing wheels of locomotive in road service. As a matter of information, we wish to add that while practically all roads are using a contour of driving-wheel tire approximating the A. R. M. M. A. standard, almost all are deviating in some particular.

In the case of switching locomotives it is felt that a flange one inch in height is perfectly safe and will be more satisfactory than the present standard, as a greater mileage can be made with the shorter flange before reaching an objectionable height. As has been previously mentioned, the A. R. M. M. A. and M. C. B. contours of tread being so nearly alike, it was felt unwise to establish a new contour having the M. C. B. flange and A. R. M. M. A. tread, and we, therefore, recommend the contour shown in the illustration for driving-wheel tires in shifting service.

The six widths of flanged tires shown on Sheet 1 of the standards are, in the committee's opinion, entirely unnecessary, and we would recommend that one width be shown; namely 5½ in. In the case of plain tires, three sizes as recommended last year are sufficient; the two sizes 6¼ in. and 6¾ in. to be eliminated.

As concerns condemning thickness of flange below 15/16 in., after carefully considering the replies received and all information available, the committee can not see its way clear to recommend flanges of wheels under locomotives and tenders being allowed to remain in service when worn below this limit.

The committee's recommendations, therefore, are as follows:

RECOMMENDATIONS.

Engine truck wheels, contour as shown in the accompanying illustration.

Tender truck wheels, contour as shown in the accompanying illustration.

Flanged driving-wheels and trailing-wheels of locomotives in road service, present A. R. M. M. A. standard of 5½ in. in width.

Flanged driving-wheels in shifting service to be as shown in the accompanying illustration.

Plain tires, present A. R. M. M. A. standard, three widths, 6 in., 6½ in. and 7 in.

Condemning limit of thickness of flange, 15/16 in.

The report is signed by:—W. C. A. Henry (Penna.), chairman; J. A. Pilcher (N. & W.); O. C. Cromwell (B. & O.); O. M. Foster (L. S. & M. S.); H. C. Oviatt (N. Y., N. H. & H.) and G. W. Seidel (C. R. I. P.).

DISCUSSION.

E. W. Pratt (C. & N. W.): I do not wish to find any fault with the contour of tires as shown in the illustration, but we on the Northwestern road think there is an extra amount of time spent in turning driving wheel and trailer tires to get the double taper, and we do not gain anything by it; that if the taper is continued out to the outer side of the tire, and a good big corner taken off, we gain the same results and save a good deal of time in turning. The committee has reported on the subject as called for by the title of the committee, but it was suggested last year, and I may have been partially responsible for the suggestion—that in re-turning tires there be some minimum flange allowance. I want to say that I was impressed very strongly and heard other members express themselves similarly when we went across the Boardwalk here last summer and saw a modern lathe turning off metal by inches, almost, to get a full-sized flange, and after they turned down to a full-sized flange, they applied a contour tool and shaved the flanges three or four times around, after that. That is a fine demonstration of what a strong tool will do, but I do not believe that is what we are after, if it is our desire to save our employer's money. I hesitate to say how much of a telltale, as we call it, we can leave on a flange and still have it safe. I am confident we can leave some and in many cases save from any amount up to a half inch of the metal in re-turned tires. We have a gage, and of course we should not allow our tires to get into such shape, that our flanges are so sharp that we will have to turn them ¾ in., or anything approaching that, but we might as well be honest, and say that these conditions do come to us, and if it is possible, I think we ought to save some of that excessive turning, and I believe it is safe to do it. There is a wide variation between this flange shown in the illustration, which measures from the throat across to the vertical inside of the tire 1¼ in. plus $^{23}/_{32}$ in., nearly 2 in., and when the tire is worn to its limit, it is $^{15}/_{16}$ in. Is there not some compromise between $^{15}/_{16}$ in. and 2 in., which makes the wheel safe to run?

F. F. Gaines (C. of Ga.): I would answer Mr. Pratt by saying, that some years ago I had some very careful records kept on the cost of turning steel-tired wheels, and what was a good limit to allow before removing them for turning them, and as a result of that investigation we found it was money thrown away to run them to $^{15}/_{16}$-in. thickness; in other words, when your tire commenced to wear on your flange, the best thing to do was to take it up and turn it, and not wait until it got to $^{15}/_{16}$-in. thickness, and if you kept a record going over the period of a few years, you would find that you will surely save metal by that method of handling.

Now, there is another important point in which I agree with the recommendations of the committee, and yet it is not entirely disposed of and that is the height of flange. Last year after our discussion on this subject, I went home and started out by having the tires on one of our road engines turned up with a 1-in. high flange, to start with. I took a switch engine and turned the tire on that engine to a ⅞ in. height of flange. These engines have been running during the past year, come and go, and we do not know they are on the road any more than any other engines we have. They have not been derailed, and nothing else has happened to them. I do not say we have got to the point where I would recommend using these flanges, but I would recommend that some more of the roads make these experiments and see if it is a possible thing to adopt 1 in. height of flange on our freight engines, and also ⅞ in. for the switch engines, because, if we can do this with safety, it will be desirable to save a lot of metal on the tire.

M. H. Haig (A. T. & S. F.): While I hesitate to question the contour outlined by the committee, I would like to point out a feature which is along the same line, in connection with which we are wasting a certain amount of metal, and which has also an undesirable effect on the rail. The recommendation is a taper of 1 in. in 20 in. for the tread of the tire. I understand that taper was originally based on the desirability of having a small portion, or a small diameter of one wheel on one rail of a curve, while there was a larger diameter of wheel on the other rail. That may hold in some cases, but not always. For instance, if the leading truck leads the front drivers as it should, there are times when the flange of the leading driver is drawn to the inner rail in rounding a curve, and in the matter of a long wheel base, the front driver may be against the outer rail, and the flange of the other drive against the inner rail. However, after an engine has been in service for some time, the tread of the tire is worn to a certain extent, to the shape of the rail, and there is not the cone shape on the tire. I believe, therefore, that it is better to endeavor to form a contour based on the shape which a tire tends to take after it has been in service, and that is certainly more nearly a cylindrical shape than a conical shape. The cylindrical shape of tire has a larger bearing area on the rail, and therefore does not subject the tire to the same stresses of the metal as when there is a smaller bearing area on the rail. A new contour of conical shape tends to bear on what you might call the near edge of the rail, whereas a cylindrical or flat tire will bear more essentially on the rail above the web. The taper of the side of the tire shown for a distance of 1¾ in. will be sufficient to clear the various frogs and other obstructions along the line and will also tend to obviate for some time the shoulder which forms after the tread has been worn to some depth by the rail. Some of the manufacturers of locomotives, unless specified otherwise by the railways purchasing locomotives, will turn new tires with a cylindrical thread and not with a conical thread, and I feel that the cylindrical thread is more economical in the amount of metal turned off as well as in the effect upon the rail.

Robt. Patterson (G. T.): I am not any more convinced this year than I was last year that we should turn our driving tires taper. I think the explanation which the committee has given in regard to tender and engine tires and tires for cars is all right. Where wheels are turned up in the same shop both for the car department and engine repairs, I think that is desirable. We, of course, run our departments entirely separately, and it is not necessary to follow the same plan in turning tires for locomotive work as for car work. Consequently we don't see any reason why we should turn

our tires taper for locomotive work. I have heard no explanation yet of why we should turn our driving tires taper except at the extreme edge. How long does that taper last on the tires after the engines are put out? You can turn them more rapidly. You can make a better job of it. Why turn them taper. As I mentioned before, the road I am representing, we invented that practice 35 years ago. What advantage is there in it? I have yet to hear of an advantage in driving tires being turned taper. It is quicker done. You can make a better job of it. You don't require an expert machinist on the lathe to turn them, and it is only a month or so when the tire becomes worn.

W. C. A. Henry (Penna. Lines): In regard to the question of economical limit, I wish to say that that was discussed by the committee, and they felt that they varied with the different conditions of power between driving wheels and other wheels, and the conditions of service and demand for power and facilities for doing the work, that it was absolutely impossible to recommend a limit that would have any meaning at all. We felt that all we could do was to recommend an extreme limit of thinness. As regards the question of the taper of the tread, I think years ago it was a very general practice to have a portion of the tread cylindrical or very nearly so, and it was often advisable to give the tread some taper, so that the tendency would be for the flange to get away from the rail. While it is true that that original taper depreciates within a short time, it seems to start the wheels wearing properly, and a tread that has that to start with will show a longer flange life than the cylindrical. There seems to be some misunderstanding with regard to the taper of the tread. Many roads apparently have examined the diagram in that book, as indicating 1 in. from the fillet to the base of the flange. The tread is cylindrical. The diagram is very small and the lines run together. As a matter of fact, in 1908, the present contour was adopted, and that was a 1907 M. C. B. contour, which is a taper of one in twenty, commencing from the fillet to the base of the flange.

C. E. Chambers (C. of N. J.): I thoroughly appreciate the remarks made of the production of a flange by turning the tire taper. I am going to ask Mr. Pratt if he has had any experience or trouble with cut flanges, where the tires are straight or nearly so, and where the taper was used at the start. I find that very much depends upon the life of the tire, whether it starts right. The making of a slight taper gives the tire the benefit of going around a slight curve, by making the inside a trifle smaller than the outside, and the greater the curve, the wider track gage naturally gives it the advantage of a still greater taper. As to the turning of full flanges, I think there are several classes of service that you could save your company actual money in, by not trying to build up a full flange on all wheels. It costs very little to remove the tires. For instance, on an 8 driver engine changing those which may have become short, the front and back tires to the middle wheels, you can start your engine out again and it runs just the same and just as long as if they were all full flanges. If it comes down to a matter of engines running 75 to 90 m. p. h., you don't have to stop to consider metal.

F. J. Harrison (B. R. & P.): I would like to state that we have been running tires since the last convention with an inch flange. In fact, we are turning everything with a flange, 1-in. high, and if a tender wheel runs with a 1-in. flange, I don"t see why an engine wheel won't run with a 1-in. flange. I don't believe there are very many representatives in this room to-day that are running with driving tires down to a ¾-in. flange, and I think a good deal of attention ought to be given to the thickness of the flanges, with the heavy powers we are getting to-day. That seems to be the trouble with our road.

E. A. Miller (N. Y. C. & St. L.): I think perhaps the conditions under which engines work has something to do with the flange. I remember at one time we went to a 1-in. flange for driving wheels, when Mr. McKenzie was superintendent of motive power, whom I was working under, and we changed them to the 1⅛ in. flange, although we have continued for many years to make the switch engine driving wheel tire flanges 1 in. During the time that Mr. Gilmore was Superintendent of Motive Power of our road, he ordered those on switch engines to be changed to ⅞ in. flange, and we were not able to run our switch engines successfully with that height of flange, we had trouble from derailment, and we went back to the 1-in. flange. I believe that we should carefully watch the brake shoes to see that the wear is proper on the face of the tread, and that they are not unduly affecting the flange; that is as important as the exact taper that is given when the tires go into service.

If any of the roads so far neglect the flanges as to allow them to get bent, we will have to do penance for that by turning off the tread in order to get a suitable flange.

John Tonge (M. & St. L.): I always found that with engines properly squared, there was no difficulty with the flange wear, none whatever. They would keep equal on the flange right along, but when you come to a 10-wheel engine, it is quite different. You have got a long distance from your front wheel to your tread, and unless you keep your truck up, which, under some conditions, it is not always advisable to do, you are going to suffer, and my best advice on that is to put flanges on all wheels, keep away from the blind tires.

Mr. Pratt: I must have been misunderstood if it was thought that I was suggesting a flat tread. My suggestion was and it is our practice, to use a uniform taper. Instead of setting two tapers on the lathe, we set a 1 in. in 20 in. taper and run it out and take a good big chunk off the outside corner. With regard to the height of flange, about 2 or 3 years ago on the Northwestern, we decided to use a ⅞-in. flange on switch engines. We had been using a ⅞-in. flange on narrow gage engines for several years. The narrow gage speed limit is very low. We had no trouble from derailment, and we adopted that for switch engines, and found that we had apparently a good many more derailments. I believe if you will refer to the illustration that I can explain to your satisfaction why we have more trouble with that lower flange. The radii at the top of the flange is ⅝ in., and the centers are located just about the same as with a ⅞-in., a 1-in. or a 1⅛-in. flange. There is a radius shown as 1⅞ in. which connects the radius at the throat and the radius at the top of the flange. There is no center point for that circle. It is the intersection between the tangents to the other two circles. Now, if you lower your flange from 1⅛ in. down to 1 in., or down to ⅞ in., that arc with the 1⅞ in. radius becomes very much more flat. Instead of standing somewhere near vertical, it is very flat, and from careful observation we found that in switching around the yards with trucks, if they have any height of flange, they frequently crawl up the rail and drop back, especially going around sharp turns. And when we had that ⅞-in. flange, this arc of the circle of which I spoke was so nearly flat that the wheel kept on going up and over.

D. J. Redding (P. & L. E.): I confirm what Mr. Pratt has just said. We had an experience along the same lines. I think it is entirely due to the fact that the top of the flange is entirely too flat. We use 1-in. flanges on all freight engines in the yard, and have no trouble at all. If you get below that, you are going to run into trouble.

C. E. Chambers (C. of N. J.): The gentleman said something about the thickness of the tire in heavy service. I would like to know as to what he had reference to.

F. J. Harrison (B. R. & P.): In reply to Mr. Chamberr' remark, the thickness of the tire we had up to about 2 years ago was about 1½ in., and from that it went to 1¾ in., now we are getting to 2⅛ in.

Mr. Tonge: I don't know as there is anything you can save money in faster than you can by taking care of a tire, even if it is only one tire. Look at the increase of mileage you are getting out of your tires; and I don't care how you are cramped for engine power or anything of that kind, there is no excuse to give for that neglect. Now, you take the engine trucks, for instance. I have seen men change a pair of engine truck wheels in 20 minutes. What would be the use of allowing that flange to get worse so as to take off ½ in. Think of all the miles of wear you are taking off and the money out of the pockets of the company you talk so much about that you want to save.

It was moved and carried that the report be accepted, and that the recommendations be submitted to letter ballot.

INCREASED POWER OBTAINED WITH SUPERHEAT.*

We regret that we are unable at this time to make a full report to this convention upon the results obtained on the Purdue locomotive in regard to the increased power obtained with superheated as compared with the maximum power obtained with saturated steam. This is due to the fact that laboratory conditions were such that all the tests of the series could not be completed until so late a date that sufficient time was not available to make a full report.

It was thought worth while, however, to make some statement in regard to the progress of the work, and, in a general way, to indicate to what extent the power of the locomotive was increased by the installation of a Schmidt superheater, which gives a rather high degree of superheat.

It will be remembered that the work reported upon the last three years was a comparison between the efficiency of the locomotive when using first, saturated steam, and then superheated steam while developing approximately the same amount of power under both conditions. When the maximum power

*Individual paper by C. H. Benjamin, Dean of the Schools of Engineering, and Louis E. Endsley, Professor of Railway Mechanical Engineering, Purdue University, Lafayette, Indiana.

was obtained upon the locomotive while using saturated steam, it required the burning of from 120 to 130 lbs. of coal per square foot of grate area per hour, whereas when superheated steam was used, and when approximately the same power was developed, only from 85 to 90 lbs. of coal per square foot of grate area were burned. This difference in the amount of coal burned while operating with saturated and superheated steam, respectively, is due to the fact that about 25 per cent. saving was made in the amount of coal burned.

The work this year has consisted in increasing the power by increasing the cut-off by small increments in an endeavor to burn the same amount of coal per square foot of grate area per hour, as was done while using saturated steam. While we have not up to this time increased the cut-off to such an extent as to make this possible, it is apparent that there will be no great difficulty in burning the same amount of coal. When these tests are completed, it can then be determined to what extent the power has been increased and by what amount the efficiency has been affected. It is evident that if this increase in the amount of coal burned can be effected without decreasing the efficiency of the locomotive, the per cent. of gain in power will be even greater than the per cent. of gain in the efficiency of the locomotive when using superheated steam than when using saturated steam. The tests made so far, however, indicate that there is a slight decrease in efficiency with increased burning of coal, so that a gain of not more than 20 or 25 per cent. in power may be anticipated.

After presenting the paper, Professor Benjamin spoke as follows: "Since this bald statement was made, the tests in the laboratory have been carried far enough to indicate some rather interesting things; for one thing, the efficiency of the cylinder due to the increased cut-off. The increased cut-off, being rather high, has materially decreased, and instead of getting for a quarter of the coal saving an increase of power of 33⅓ per cent., we are only getting an increase of power of some 15 per cent. That is, the efficiency of the cylinder as a separate unit, has decreased almost 16 per cent. The increase of steam necessary to develop a horse-power has gone up about 15 per cent., due to an increase in cut-off of from 45 per cent. in a saturated engine to 70 per cent. in a superheated engine, using the same amount of coal. This increase has been brought about by dropping the reverse lever down until we are running on notches amounting to about 5 per cent. for each notch and we are gaining a cut-off of 14 in. When we get up to the 70 per cent cut-off, we are not getting the efficiency out of our steam. What we are now planning to do is to finish this series of tests with the same sized cylinder and then to increase the size of the cylinder to an amount which will give us the same cut-off with a superheated engine that we have with a saturated engine. This, figured on a basis of 45 per cent. cut-off, will require your cylinders to increase from 16 in. in diameter to about 21 in., the engine now being a 16-in. x 24-in. cylinder. Of course, if this increased size of cylinders should be carried out on your engines, without decreasing your boiler, you would have a very slippery engine, but we are not interested in the slipperiness of the engine, because at the speed at which we are running, it is not necessary to figure on the engine slipping, because the tractive power will not be over ⅛ of the weight of the drivers. The efficiency of the cylinders at 160-lb. to 200-lb. pressure, is developing practically the same, so that we can decrease our pressure to 160 lb. and get the same drawing power with a superheated engine that we would get at 200-lb. pressure if we had a saturated engine. We hope next year to make a full report as to just what we can get out of the larger cylinders.

Paul H. Brangs: In an article by E. D. Dreyfus, in the April, 1912, issue of the *Electric Journal* the decrease in the turbine water rate due to the use of superheated steam is given as follows: 50 deg. superheat, 5 per cent.; 100 deg. superheat, 10 per cent.; 150 deg. superheat, 14 per cent. A paper entitled "Recent Developments in Steam Turbine Practice," by K. Baumann, read before the Manchester section of the Institution of Electrical Engineers, January 16, 1912, gives the following figures: 0 to 100 deg., 1 per cent. improvement on the steam consumption for every 100 deg. F.; 100 deg. to 200 deg. superheat, 1 per cent. improvement of steam consumption for every 12 deg. F. This paper also brings out another important point, viz.: that the efficiency increases considerably with increase in superheat the following figures being given: For 100 deg. superheat 2.5 per cent. better efficiency, and 6.75 per cent. better efficiency for 200 deg. superheat.

The improvement in steam consumption and turbine efficiency given above due to the use of superheat, are compared to the efficiency and steam consumption with dry saturated steam. Ordinarily, however, steam, supposedly dry, will contain a small amount of moisture which causes a reduction in efficiency. According to the paper referred to above, the efficiency will change 1 per cent. for each 1 per cent. variation in wetness, and therefore steam consumption measured as condensed water will be 2 per cent. higher for each 1 per cent. increase in moisture. With reciprocating engines, the presence of moisture in the steam has a still greater detrimental effect as it greatly augments cylinder condensation. For this reason increase in economy of from 12 to 20 per cent. is not uncommon with low superheating of from 40 deg. to 100 deg. F.

The saving in coal consumption, due to the use of superheated steam is not as large as the percentage saving in steam consumption. 100 deg. superheat will reduce the steam consumption of a turbine, say, 10 per cent. This means that instead of 1 lb. of water evaporated under dry and saturated conditions, only .9 lb. of water need be required if the steam be superheated 100 deg. Assuming the feed temperature as 200 deg. the heat absorbed in the boiler for 1 lb. of steam at 150 lbs. gage without superheat is 1,027 b. t. u. The heat in .9 lb. of steam under the same conditions, is 9,243 lb. t. u., the difference, 1,027 b. t. u., being saved. To secure this saving in the amount of water evaporated, 100 deg. superheat must be applied to each pound of steam. According to the latest steam lb. of steam under the same conditions, is 9,243 b. t. u., the This amount of heat, added as superheat, saves twice as much heat, 102.7 b. t. u. in the boiler. It may therefore be said that by using superheated steam there is obtained a fuel economy equal to half of the steam saving. This means that heat imparted to a superheater is just twice as valuable and generates just twice as much power as heat imparted to a boiler.

The excellent papers that have been presented before this association on superheaters, the last two or three years are very commendable. The very useful work and important data bearing on this subject, which has been furnished by Prof. Endsley of Purdue University, is of great benefit to the railways of this and other countries, and the work done by locomotive engineers has been thorough and satisfactory. The splendid work of H. H. Vaughan of the Canadian Pacific, has also been of material benefit to our association, as well as paving the way for more extensive use of superheaters in connection with locomotive and stationary boilers. There have been very many interesting papers and subjects brought before this association in the past decade, and no subject is more interesting and of greater value than the question of superheated steam, in connection with high power central station work and locomotive practice.

W. F. M. Goss: I rise merely for the purpose of making a very brief observation. My impression is that this is the time for a new testing plant. This plant has been in operation now for 21 years, and I want to remind the members of the association that almost every year it has brought a contribution to the association during those 21 years; and I think that if an index were made of the subjects of reports contributed, it would be found to cover a pretty wide range of the association's interests; and in making this observation, I want to express the hope that means will be supplied to Prof. Endsley, whereby this testing plant will be continued.

C. D. Young (Penna.). Mr. Endsley, if I understand him correctly, has not developed the point so far on his tests that he did not form some observations which we have recently made where we are using a high degree of superheat. It was thought that if superheated steam was furnished to the cylinders of an engine, that certain economies would develop. We found that under certain conditions, the water rate on the cylinders would be poorer with a dry and saturated steam furnished under different conditions. That came up in this way: In operating a very large cylinder with superheated steam furnished at 160 or 150 lb. boiler pressure, with 260 degs. of superheat, it was necessary, in order to do the work, to use a cut-off of approximately 70 per cent. and a piston speed of about 350 f. p. m. In other words, this was slow speed, 10 mile service. Under these conditions the water rate was about 26 lb. to 27 lb. of steam per hour, showing quite clearly that where the piston speed is low and the cut-off long there is no economy in superheating; and if it is operated only under those conditions, it would not pay to put a superheater on the boiler. I believe that confirms what Prof. Endsley has found out so far. There is one point which Prof. Endsley brought up which is of interest. He stated that he had obtained the same amount of power from a superheated locomotive, with a reduction in boiler pressure of approximately 40 lb. I think that in modern practice it is necessary to obtain all the power you possibly can, and it is not advisable to reduce the boiler pressure in a great many cases for the simple reason that you have not clearance space enough to make the cylinders big enough to operate with the lower boiler pressure, and in order to operate it, it is necessary to keep the cylinder down to 27 in. or 28 in. in diameter, and therefore you must hold the boiler pressure up to 200 lb. in order to produce the power desired. That being the case, it seems to me that something should be done

as to the boiler pressures which are required under the existing conditions of design. I think if it is possible it would be well for you to consider next year a thorough range in the investigation around the present modern boiler pressures which are absolutely necessary to the designer in order to get the cylinders through the clearance which is provided.

Prof. L. E. Endsley: I might say that I did not mean to state that we were not going to do any work at 200-lb. pressure; we are going to do work at 160 lbs. and 200 lbs., and even as low as 120 lbs. We are doing some work that low. Our boiler is equipped to run at 240 lbs. What I did mean to say was, that you can increase your cylinders 4 to 5 inches and reduce your cut-off, and not cause a slippery engine—because you know what will happen. What we are going to do is to carry the tests with the largest cylinder, at 160 lbs. and 200 lbs., and possibly 240 lbs., next year. So we will have the entire field covered.

C. A. Seley (C. R. I. & P.): I move that the thanks of the association, expressing our appreciation, be extended to the gentlemen who have given us this paper. The motion was carried.

STEEL TIRES.

Since the last convention, the committee, which was continued with a view to presenting a specification from which railway companies could purchase tires, with confidence that they would give the service expected, have worked to that end. Recognizing the importance of a drop test, the committee has gone to considerable trouble in getting the very best practice of the old and new worlds, but as will be seen, clause 8 leaves it optional with the railway companies to demand or not as they wish. The rules for the drop test have been drawn up

L. R. JOHNSON,

Chairman, Committee on Steel Tires.

with the idea of utilizing as far as possible the drop-test machines already in use for other purposes, and so sparing the manufacturers the expense of making special ones for tires.

SPECIFICATION FOR STEEL TIRES.

1. Material.—Stock for tires shall be made by the open-hearth or crucible process.

2. Classes.—There will be three classes of tires for the different classes of service as follows:

Class 1. Driving tires for passenger engines.
Class 2. Driving tires for freight engines.
Class 3. Driving tires for switching engines, and tires for engine truck, tender truck, trailers, and car wheels.

3. Chemical Composition.—

Class 1.	Carbon not less than	0.50 per cent. or over 0.70 per cent.
	Phosphorus, not over	0.05 per cent.
	Manganese between	0.50 per cent. and 0.80 per cent.
	Sulphur, not over	0.05 per cent.
Class 2.	Carbon, not less than	0.60 per cent. or over 0.80 per cent.
	Phosphorus, not over	0.05 per cent.
	Manganese between	0.50 per cent. and 0.80 per cent.
	Sulphur, not over	0.05 per cent.
Class 3.	Carbon, not less than	0.70 per cent. or over 0.85 per cent.
	Phosphorus, not over	0.05 per cent.
	Manganese between	0.50 per cent. and 0.80 per cent.
	Sulphur, not over	0.05 per cent.

4. Finish.—The tires must be free from defects of any kind, and finished tires must be accurately machined to the prescribed dimensions of the Master Mechanics' standard, and roungh tires must not be outside the limits of the attached prints.

5. Branding.—The tires shall be distinctly stamped when hot with such brands as the purchaser may require, and in such a manner that those marks shall be legible when the tires are worn out.

6. Samples for Chemical Analysis.—Drillings from a small test ingot cast with the heat, or turnings, from a tensile specimen, or turnings from a tire (where tires are machined at the works of the manufacturer) shall be used to determine whether the chemical composition of the heat is within the limits specified in paragraph 3. When required, the purchaser or his representative shall be furnished an analysis of each heat from which tires are made.

7. Physical Properties.—The steel for the different classes of service shall meet the following minimum physical requirements:

Class.	Tensile strength. Lbs. per sq. in.	Elongation per cent. in 4 in.
(a)	105,000	Quotient of 1,556,000 divided by the tensile strength.
(b)	115,000	Quotient of 1,300,000 divided by the tensile strength.
(c)	125,000	Quotient of 1,150,000 divided by the tensile strength.

8. Falling Weight Test.—Should the contract call for a falling weight test, a test tire from each heat represented shall be selected by the purchaser or his representative and furnished at his expense, provided it meets the requirements.

8a. The test tire shall be placed vertically under the drop in a running position on a spring foundation with an anvil of at least ten tons weight, and shall be subjected to successive blows from a tup weighing 2,000 lbs. falling from heights of 5 ft., 10 ft., 15 ft. and 30 ft. and upwards, until the required deflection is obtained as specified in paragraph 8b.

8b. The test tire shall stand the drop test described in paragraph 8a without breaking or cracking and shall show a minimum deflection equal to X in the following table:

	Class No. 1.	Class No. 2	Class No. 3.
3 ft. diameter and over.....	$\frac{3\,d}{6\,t}$	$\frac{3\,d}{10\,t}$	$\frac{3\,d}{12\,t}$
Under 3 ft. diameter.....	$\frac{3\,d}{10\,t}$	$\frac{3\,d}{12\,t}$	$\frac{3\,d}{14\,t}$

Internal diameter of tire = d. Thickness of tire = t.

8c. A specimen for the tensile test is to be taken from a tire that has been subjected to a falling weight test, and it shall be cut cold from the tested tire at the point least affected by the falling weight test. The tensile test specimen when cut from a tire that has been subjected to a falling weight test shall be cut normal to the radius and parallel to the face.

8d. Should the test tire fail to meet these requirements in any particular, two more test tires shall be selected from the same heat if the manufacturer so desires, and at his expense. Should these two tires fulfil the requirements, the heat shall be accepted.

9. Inspection.—The inspector representing the purchaser shall have free entry to the works of the manufacturer at all times while his contract is being executed. All reasonable facilities shall be afforded to the inspector by the manufacturer to satisfy him that the tires are being furnisned in accordance with the specifications. All tests and inspections shall be made at the place of manufacture prior to shipment, and shall be conducted so as not to interfere unnecessarily with the operations of the mill.

Tires must be rolled in accordance with the best practice, sufficient metal being discarded to insure sound tires. The tire taken from the bottom of the ingot must be stamped with the letter *A*, before the tire number, the next above *B*, and so on up the ingot.

Tensile test specimens, one from each heat, must be forwarded to the engineer of tests of the railway company, together with a copy of the chemical analysis of each heat, showing the tire numbers rolled from each heat; also destination of each tire, together with the railway company's purchasing agent's order number. If, however, the manufacturer is rolling tires right along for the railroad company, and their inspector is at their plant, the test specimens from heats ready at that time may be pulled at the manufacturer's plant by the inspector and the broken test pieces sent in for analysis, in which case the above information must be furnished the inspector.

An analysis of the test piece made by the railway company's test bureau must agree with that furnished by the manufacturer, and with an analysis made from turnings from the tires after received; a failure to agree within reasonable limits will be cause for rejection.

In addition to the above tests, the railway company reserves

the right to make a repetition of any tests to make sure that only material meeting all requirements set forth in this specification be accepted, and all material found not up to any one or all of these requirements will be rejected.

Samples representing rejected material will be retained in the test bureau not longer than thirty days from date of test. If at the end of that period the sellers have not signified their desire for a rehearing, it will be understood that they agree with the results as reported. If by this time the sellers have not given shipping directions for material rejected at destination, the material represented by the samples will be returned to them at their risk, they paying freight both ways.

The report is signed by:—L. R. Johnson (C. P.), chairman; R. L. Ettinger (So. Ry.); J. R. Onderdonk (B. & O.); C. H. Hogan (N. Y. C. & H. R.) and L. H. Turner (P. & L. E.).

The secretary: The report was received, and action on the recommendation was deferred another year.

LOW WATER BOILER TESTS.

The accompanying photographs show the general arrangement of the boilers and accessories for the low water boiler tests which will be made on June 20, 1912, at Coatesville, Pa. These tests will be the culmination of an extensive series of researches that have been under way for five months for the purpose of determining the relative efficiency, capacity, water circulation and strength of a Jacobs-Shupert and a normal radial stay boiler. All this work has been outlined by and conducted under the direction of Dr. W. F. M. Goss, Dean of the Schools of Engineering, University of Illinois.

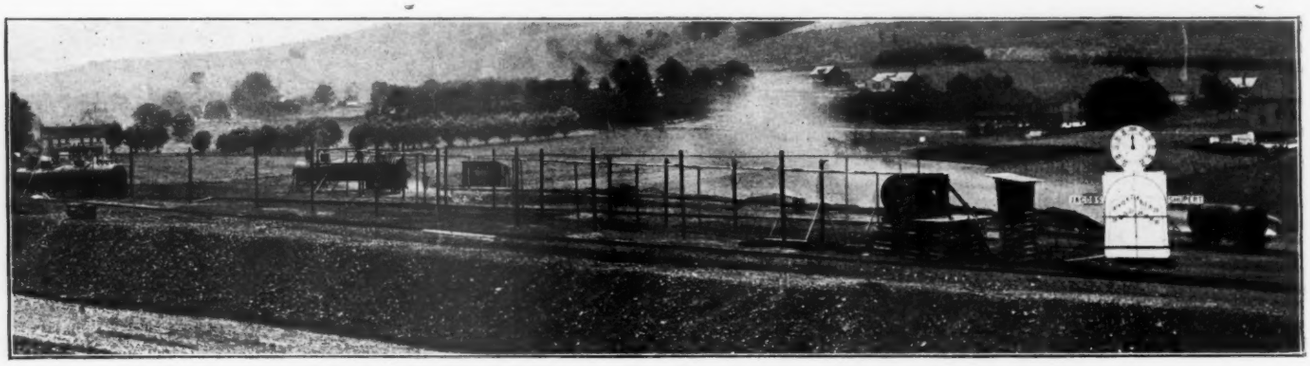
Both boilers are identical in design and size, except that one has a Jacobs-Shupert firebox, while the other has a radial stay firebox of standard construction. The general dimensions of each boiler are as follows:

Outside diameter of shell of boiler at front end...	70 in.
Diameter of shell at throat.....	83⅞ in.
Number of 2¼-in. tubes.....	290.
Length of tubes.....	218 in.
Inside length of firebox.....	109⅝ in.
Inside width of firebox.....	76⅛ in.

Each boiler has a total heating surface of about 3,000 sq. ft.

For the purposes of the low water tests, the two boilers have been placed on the cinder dump of the Lukens Iron & Steel Company, and a grandstand has been erected on a hill about 2,500 ft. from the nearest boiler, in order to afford a good view without danger if explosion takes place.

Both boilers will be fired with oil, and the feed water will be supplied from a large pump, operated by an auxiliary boiler not visible in the photographs. The boilers will be controlled by the observers from the inside of a firebox turned on its side and placed about 225 ft. distant from the nearest boiler. All valves controlling the oil fuel, water supply and steam discharge are located within this firebox barricade. The elevated tank just to the right of the barri-



General View of Apparatus Arranged for Low Water Tests at Coatesville.

Water Level and Steam Pressure Indicator at Coatesville Tests.

cade contains the oil fuel, which flows therefrom to the burners by gravity.

The test boilers are placed about 50 ft. apart. The firebox end of each rests on a concrete foundation, and the front end rests on light tumblers, so that when explosion takes place, the movement will be away from the observers.

In order that all witnesses can be kept constantly informed during the progress of the tests, a novel water level and steam pressure indicator has been erected. This consists of a large board, on which there is an outline of the cross-section of the firebox. A block bar, movable vertically, extends across this board and represents the water level. The observers in the barricade can control the position of this bar, which can be plainly seen from the grandstand. On top of this board is a large dial with a movable pointer, and by means of this the steam pressure and any variations thereof will be indicated.

The Jacobs-Shupert boiler will be the first one tested. The test will begin by bringing the boiler up to normal working pressure and water level. The excess steam generated by the boiler will blow off through the pop valves, the principal portion will pass through the exhaust pipe and up the stack in the usual manner to produce the necessary draft. When the rate at which it is working has become fairly high and representative of service conditions, the feed water supply will be shut off. The water level will therefore gradually drop and finally go below the crown sheet, thus causing overheating of the metal and ultimate failure. As soon as the Jacobs-Shupert boiler is tested, the radical stay will be similarly treated. A small fire will continue in the radical stay boiler during the test of the Jacobs-Shupert so that no time will be lost in getting the second test under way.

The tests will begin at 1 P. M. Guests from Atlantic City should reach Philadelphia, Broad Street Station, in time to catch the train leaving there at 11:45 A. M., which reaches Coatesville at 12:48 P. M. In order to catch this train it will be necessary to leave Atlantic City at 10 A. M. via. the Pennsylvania, Delaware River Bridge route. Guests can leave Coatesville going west at 5:46 P. M., reaching Harrisburg at 7:20 P. M., and going east can leave at 5:16 P. M., reaching Philadelphia at 6:23 P. M. Incoming trains will be met at Coatesville by representatives of the firebox company and conveyances will be provided to take the guests to the grandstand and demonstration field, where a buffet luncheon will be served.

INFORMAL DANCE ON THE PIER.

An informal dance was given on the Million Dollar Pier last night. It was largely attended, and the crowd seemed to have a very good time. The committee in special charge was composed of Thomas Farmer, Jr., chairman, E. S. Toothe, W. J. Walsh, H. E. Osterreich, Harry S. Hammond, William Miller, H. A. Nealley, E. F. Chaffee, Roger J. Faure.

SUPERHEATED STEAM ON MALLET LOCOMOTIVES.

The popularity of the Mallet locomotive, occasioned by the saving it is possible to obtain on account of the great amount of power developed by a single unit, was influenced to some extent at the start by the low efficiencies attending its operation. The condensation losses of the Mallet locomotive are abnormally high because of the large cooling surfaces in the steam passages from the boiler to the cylinders and in the cylinders themselves. To eliminate these losses, and to raise the standard of efficiency of operation of so large a unit to what it should be, the use of superheated steam has been resorted to in some cases.

Two distinct methods were adopted at the beginning. One introduced two superheaters; one between the boiler and the high pressure cylinders, and the other between the high and the low pressure cylinders. This method is accompanied by high installation and maintenance cost, and considerable difficulty in maintaining the superheater between the high and the low pressure cylinders on account of its inaccessibility.

The other method is that in which but one superheater is used, placed between the boiler and the high pressure cylinders, and giving the steam a high initial temperature before it enters the high pressure cylinder. This temperature should be sufficient to carry it to the low pressure exhaust without condensation losses. The superheater employed to accomplish this is

ENTERTAINMENT COMMITTEE.

Upper row, left to right: McClintock, Landreth, Nellis, Chaffee, Hammond, Kreps, Illingworth.
Bottom, left to right: Sherman, Wardell, Toothe, Dunkelberg, Walsh, Mitchell, Hibbard, Younglove, Nealley, Green, Furry.

of the fire tube type, which delivers steam at a temperature of from 600 to 650 degrees F., and is located in a manner which makes its installation and maintenance possible at the expense of a minimum amount of labor.

Conclusive and reliable tests have been made to determine the economies obtained by the use of highly superheated steam, and in every case they indicate a remarkable saving in coal and water, as well as the increase in drawbar pull. Through ranges of speed from twelve to eighteen miles an hour, averages show a saving of dry coal per dynamometer horsepower of about 28 per cent., and an increased drawbar pull of 12 per cent. This saving and the increase in tractive effort show clearly the part that the superheater has played in making the Mallet engine an economical unit.

Another advantage of the superheater applied to Mallet engines is the protection afforded against damage to the high pressure steam pipes, steam chests and cylinders, occasioned by foaming. This percentage of priming is greater in the Mallet type than in the older types, on account of the length of the boiler. With the use of the superheater it is practically impossible for water carried into the dry pipe to reach the cylinders in the form of water.

In the last analysis the operating limit of any locomotive is fixed by the ability of the fireman to properly supply fuel to the firebox. As a result of the application of an efficient superheater the capacity of the fireman, measured by the drawbar pull, is increased to an even greater percentage than the reduction in coal consumption.

REVENGE!

When the women go a shopping
And take us dubs along,
They try to make us think we're it,
And right where we belong.

They ask us our opinions
On lacy lingerie,
But how much we will pay is what
They really want to see.

But every doggie has his day—
And now *our* turn has come.
So get together, brothers,
And we'll surely have some fun.

Let one and all his wifey bring,
Out on the great big pier.
No matter where we stop and talk
You'll bore her; never fear.

Go talk to Bourne on his device;
On superheated steam.
Before he's through she'll tear her hair
And then let out a scream.

There's Weatherly, of valve gear fame,
Whose spiel on lap and lead
Will make her want to grab a train
To Reno to be freed.

At last a talk on cutting speeds,
Done on the Bullard tool,
Will prove to her, without a doubt,
You're not a *silly* fool.

So after all, that's all we want;
Don't care about the bills.
If only they will leave us home
When purchasing their frills.

DEATH OF MAJOR E. H. JANNEY.

E. H. Janney, inventor of the coupler which bears his name, and which was the origin of the present M. C. B. standard coupler, died at his old home, Alexandria, Va., June 16, aged 80 years. Major Janney was field quartermaster on the staff of Gen. Robert E. Lee during the Civil War. The Janney coupler was first applied to passenger cars on the Fort Wayne line under the direction of J. D. Laing. About 1878 the McConway & Torley Company assumed control of the patents and began making the Janney coupler. They developed it so that it was adopted for passenger cars by the Pennsylvania Railroad, and soon found application on freight cars, and the lines and principle were adopted as standard by the M. C. B. Association in 1887. After selling the patent, Mr. Janney retired from active mechanical work and purchased a farm near Alexandria, where he quietly spent his remaining years. Mr. Janney was a clerk in a grocery store at the time he invented the coupler and we are thus indebted to the mercantile business for this valuable invention. The idea was suggested by the clasping of two hands in a vertical position with the knuckles bent.

M. M. REGISTRATION.

Aldcorn, Thos., Chicago Pneumatic Tool Co., Marlborough-Blenheim.
Allen, G. S., Retired M. M., P. & R. Ry., Shelburne.
Antz, Oscar, G. C. L. E., N. Y. C. Lines, Pennhurst.
Boyden, J. A., M. M., Erie R. R., Chalfonte.
Cross, W., Asst. to 2nd Vice-Pres., Can. Pac. Ry., Marborough-Blenheim.
Dalton, Wm., Chief Engr., Traymore.
Dickson, Geo., Insp. Dept., Baldwin Loco. Wks.
Eich, H. C., M. M., Ill. Central, Haddon Hall.
Elliott, J. B., M. M., Baltimore & Ohio R. R., Elberon.
Fitz Simmons, E. S., Mech. Supt., Erie R. R., Shelburne.
Fulmore, John H., M. M. Penna. R. R.
Gilmour, Geo., Supt. Inspt., Travelers Ins. Co., Rudolf.
Goss, W. F. M., Univesity of Illinois, Haddon Hall.
Henderson, Geo. R.
Herr, E. E., Engine House For., P. R. R.
Hill, James W., M. M., Peoria & Pekin Union, Lexington.
Lanza, Galtano.
Leach, W. B., Marlborough-Blenheim.
Lewis, W. H., S. M. P., Norfolk & Western R. R., Marlborough-Blenheim.
McCarthy, M. J., S. S., C. C. C. & St. L. R. R., Marborough-Blenheim.
Markey, Jas., M. M., Grand Trunk Ry., Haddon Hall.
Patterson, Robert, M. M., Grand Trunk Ry., Marlborough-Blenheim.
Smith, Carl B., M. E., Boston & Maine R. R., Brighton.
Turner, J. S., Sales Agent, Pressed Steel Car Co., Marborough-Blenheim.
Wilson, Charles, M. M., Lehigh Valley R. R., Elberon.
Woodbridge, H. C., Gen'l Mgr's Special Rep., B. R. & P., Arlington.

M. M. GUESTS.

Allen, T. B., Engine Dispatcher, Penna.
Arter, Wilbur D., Asst. Eng., N. Y. Central, Pennhurst.
Austin, Geo., G. B. I., A. T. & S. F., Marlborough-Blenheim.
Balfour, C. J., Gang Leader, Penna. R. R.
Beck, Henry J., Gen. Loco. Insp., Spydel.
Beck, I. H., Air Brake Foreman, C. R. R. of N. J., Speidel.
Bixby, O. M., Electrical Dept., N. Y. C. & H. R. R., Lexington.
Campbell, H. A. T.
Carey, J. T., M. P., P. R. R.
Carter, G. H., Gen. Foreman, P. & R., Norwood.
Cooper, W. H., Div. Storekeeper, P. & R.
Cotton, A. C., S. P. P., P. R. R., Shelburne.
Cox, Millard F., M. E., L. & N. R. R., Chalfonte.
Cramer, C. B., Gen. Foreman, Wash. Terminal Co.
Crossman, T. E., Official Reporter, St. Charles.
Co., Whittel.
Daly, John J., Boiler Maker For., P. & R. R. Y. Co., Ramsey.

Davidson, W. W., Gen. Foreman Trenton Shop, Penna. R. R.
Davis, P. L., M. P. Insp., P. R. R.
Dawson, W C., Foreman, Wash. Terminal Co.
DeSalis, J. H., Chief Rd. For. Engines, N. Y. C. & H. R.,
Dillon, Howard W., Draughtsman, P. R. R. Pennhurst.
Diven, J B., Asst. Engr. M. P., Pennsylvania.
Dix, Chas. S., Boiler Maker, P. R. R., Atlantic City.
Eggleston, Harry D., Rd. For. Engs., P. & R.
English, J. P., Night For., Central R. R. of N. J.
Finney, H. R., Asst. Rd. For. of Engines, P. R. R., Chalfonte.
Frost, H., Enginehouse Foreman, Penn. R. R.
Gallagher, F. S., Asst. Mech. Eng., N. Y. C. & H. R. R. R.,
Gallagher, P. F., Shop Foreman, B. & O., Lexington. Marlborough-Blenheim.
Galloway, W. S., Asst. P. A., B. & O. R. R., Marlborough-Blenheim.
Gerhardt, E. A., Clerk, D. L. & W., Lexington.
Gormley, J., Asst. Trainmaster, P. R. R., Jackson.
Goslive, E. W., Foreman Pipe Dept., P. R. R.
Gough, P. J., Storekeeper, P. & R., Norwood.
Graham, J. P., Foreman Elec. Dept., P. R. R., Dunlop.
Green, G. H., Chief Insp., Rock Island, Shelburne.
Groosoors, Edw. W., Foreman, P. R. R.
Guinand, Harry W., Clerk Pur. Dept., Penna.
Haines, W. S., M. M., Erie R. R., Schlitz.
Hall, G. A., Frt. Conductor Meritorious Service, Penna. R. R.
Herbert, Wm. A., Foreman Terminal, P. R. R.
Hinis, J. P., Gen. Foreman Loco. Shops, B. & O., Monticello.
Hinkle, H. M., Asst. Rd. Foreman of Engines, Penna., Ellwood.
Hofmann, G. W., Asst Rd. Foreman, Northern Central R. R.
Hosack, W. K., Mach. Foreman, B. & O., Monticello.
Howes, A. F., Loco. Engr., C. & N. W.
Hunt, J. F., Shop Clerk, West Jersey & Sea Shore.
Hurley, W. J., Supt. Mech. Instruction, N. Y. Central H. R. R. R., Marlborough-Blenheim.
Jay, Thos. C., Ck. Office of Mech. Engr., D. L. & W. R. R., Dennis.
Justice, H. B., Asst. S. K., P. R. R.
Kelly, R. J., Gen. For. Car Shops, Long Island, Traymore.
Kreider, Charles N., Gen. Boiler insp., P. & R., Monticello.
Ligon, L. P., M. M., N. & W.
Linthicum, Frank, A. R. F. E., West Jersey & Seashore R. R.
Longacre, C. J., G. H., P. R. R.
Lovett, Alfred E., F. P. T. D., Penna. R. R. Co., Arlington.
Lukens, Howard A., Clerk to P. M. Agent, Penna.
Mahoney, M. A., Claim Agt., N. Y. C., Galen Hall.
Mallam, T. L., Foreman, P. R. R.
Mansfield, J. J., Ch. Boiler Insp., C. R. R. of N. J., Arlington.
McMenamin, Chas. G., M. P. S., Pennsylvania, Chalfonte.
McSweeney, J. T., Shop Foreman, B. & O., Lexington.
Meehan, J. E., Painter, P. R. R.
Miller, T. E., Rd. F. of Eng., B. & O. R. R., Lexington.
Monath, J. W., Gang Leader, P. R. R., Iroquois.
Montgomery, Wm. H., Trav. Freight Solicitor, P. R. R.
Murray, J. B., Ass't F., P. R. R.
Murray, L. B., Engineer, The Virginian R. R., Strand.
Nation, J. D., Traveling Eng. Penna.
Neale, F. A., Gen. For. C. R. R. of N. J., Pennhurst.
Nelson, W. J., Jr., Ck. P. D., Penna.
Nicholas, R. H., Genl. Foreman, Central R. R. of N. J.
Oswald, Wm. E., Shop Foreman, C. R. R. of N. J., Edison.
Ott, Wm. B., M. M., P. R. R., Whittle.
Reynolds, J. H., Clk. Office Shop, P. R. R.
Russell, Harry B., Engine House For., P. & R.
Roberts, G. H., Machine Foreman, Long Island, Pennhurst.
Roberts, W. N., Foreman, P. R. R.
Roche, J. J., Blacksmith Foreman, C. R. R. of N. J., Islesworth.
Rommel, G., M. M., B. & O.
Sanford, H. F., A. B. I. of N. J. Div., P. R. R. Co.
Sanford, J. W., Retired M. M., W. J. & S. R. R. Co.
Scott, Harry C., Foreman Machinist, C. R. R. of N. J., Fredonia.
Scott, H. E., Foreman Tin Shop, P. R. R.
Seiders, Irwin A., Rd. For. of Engines, P. & R., Monticello.
Sensenbach, C. A., Foreman Blacksmith, Pa. R. R., Ardmore.
Struter, L. P., Air Brake Engr., Illinois Central R. R., Haddon Hall.
Thompson, G. M., Machinist, Penna.
Toomey, T. H., F. E. Shops, P. R. R.
Watson, David, Genl. Foreman, B. & O., Baltimore House.
Westley, Isaiah S., For. Engine Shop, P. & R.
Williams, David T., Mech. Eng., P. & R.
Wilson, G. E., S. L. O., B. & O. R. R., Young's.
Wilson J. M., Eng. House For., P. & R., Elberon.
Winkler, L., Machinist, Penna.
Woollven, F., Mech. Dept., Baldwin Wks., Ostend.
Woolven, J. C., Mech. Dept., Grand Trunk, Ostend.
Yost, Wm. M. K., Ch. Dept., P. & R., Shelburne.

Conventionalities.

Komical Jack Turner, the Pressed Steel Car man, arrived on late schedule Sunday with a brand new stock of "sayings."

H. W. Jacobs, assistant superintendent of motive power of the Santa Fe, is here to attend the Master Mechanics' convention.

Mrs. R. D. Smith is confined to her room at the Dennis with a badly sprained ankle received while visiting the exhibits on the pier.

Emmett K. Conneely, purchasing agent of the Pittsburgh & Lake Erie, is stopping at the Brighton. Mrs. Conneely is with him this year.

H. Wright, an examiner of patents for the United States government at Washington, is attending the convention and is stopping at the Marlborough-Blenheim.

R. M. Dixon, president of the Safety Car Heating & Lighting Company, arrived Monday night and is registered at the Dennis. Mr. Dixon returned at the end of May from a five weeks' trip to Europe.

C. L. Bundy, General Car Foreman of the Delaware, Lackawanna & Western.

Chairman Philip J. Mitchell, of the entertainment committee, was presented with an appropriate gift by the members of his committee Tuesday afternoon.

Mrs. M. K. Barnum had expected to attend the convention this year, but remained home to attend instead the high school graduation exercises of the youngest son.

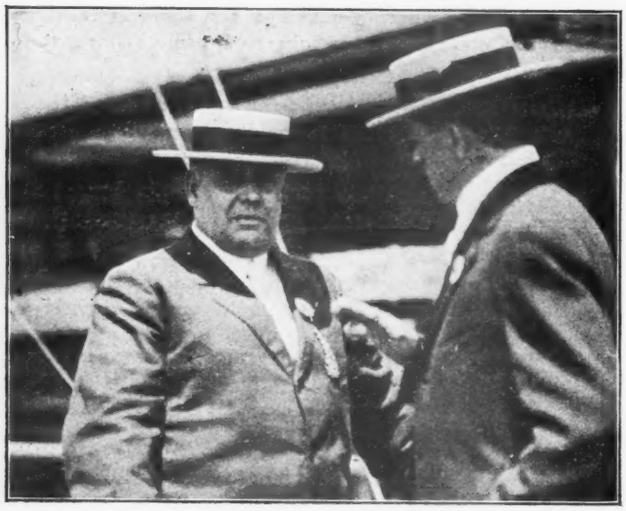
George A. Bardon, of the Chicago Pneumatic Tool Company, is attending the M. M. convention. He is stopping at Young's, and is accompanied by Mrs. Bardon.

R. B. Keller, superintendent of apprentices on the Delaware, Lackawanna & Western, is stopping at Haddon Hall. The apprentice instruction on the Lackawanna is being extended and is giving good results.

Walter H. Cottingham, president of the Sherwin-Williams Company, accompanied by his family, will sail on the "Celtic" on June 20 for England. They will occupy their country estate near London during the summer.

E. S. Wortham, purchasing agent and assistant to the vice-president of the Chicago & Alton, through a stenographic error, was transferred to the C. & O. in Monday's registration. We are pleased to put him back on the C. & A.

Tuesday must surely have been "tag day" on the pier, for George Molleson was observed wearing two supplymen's



W. H. Dooley, Superintendent of Motive Power of the Queen & Crescent.

badges. Inasmuch as he had registered as representing two companies, the guards at the door allowed him to enter as often as he pleased.

One thing that has been even more missed this year than J. Will Johnson's band of last year has been Secretary Joe Taylor's white suit. The soft pedal that has been applied to so many things this year seems to have affected the esteemed secretary's sartorial tastes.

W. N. Mitchell, of the International Correspondence School, is the happy possessor of two Republican National Convention tickets. While in Atlantic City for the conventions he received two telegraphic offers for his tickets, but declined both. He left Monday for Chicago.

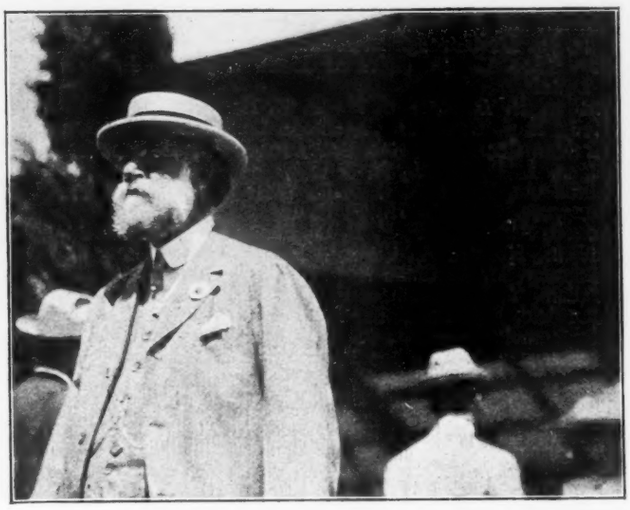
I. N. Kalbaugh, S. M. P., Coal & Coke Company, and F. B. Ernst.

S. L. Bean, mechanical superintendent of the Santa Fe, is the second railroader from Los Angeles, Cal., to attend the conventions this year, D. P. Kellogg, shop superintendent of the Southern Pacific, also being here. Mr. Bean makes a most favorable report of conditions on the Santa Fe and on the Pacific coast.

H. A. F. Campbell, designer at the Baldwin Locomotive Works, is numbered among the special guests. He has recently developed some very interesting information in connection with the counterbalancing of locomotives, which has had a very noticeable effect on the steadiness of some of the recent high speed power.

George W. Kelley, blacksmith foreman of the Central Railroad of New Jersey and a prominent member of the International Railroad Master Blacksmiths' Association, spent a day at Atlantic City looking over the exhibits. He predicts a record breaking meeting of the Master Blacksmiths' Association in Chicago next August.

Not according to the editor, but through a liberty taken by the compositor, it was stated in this column yesterday that Mrs. Flint "was formerly for several years with Manning, Maxwell & Moore." While it is clear that the "s" was



W. C. Arp, Superintendent of Motive Power of the Vandalia.

inserted in error, we hasten to explain that it was Mr. Flint, not Mrs. Flint, who was with the concern named.

J. J. McCarthy, president of the Chicago-Cleveland Car Roofing Company and ex-president of the Hod Carriers' Union, an organization of prominence in the "good old Saratoga days," is not here because of illness in his family. This is the first time in many years that Mr. McCarthy has not put in an appearance at these annual gatherings.

L. R. Pomeroy, who has been an associate member of the Master Mechanics' Association since 1889, is continuing his custom of not missing a convention. He arrived on Monday morning, and will attend the low water boiler tests at Coatesville at the close of the meetings. Mr. Pomeroy is now in consulting practice in New York.

Farmer L. H. Turner sent word by his assistant, Dave Redding, that he could not find time to attend the conventions this year. It is believed, however, that this is only modesty on his part; the fact that his road has been selected by a noted efficiency engineer as a model of scientific management seems to have embarrassed him and scared him away.

W. C. Hayes, president of the Traveling Engineers' Association and superintendent of locomotive operation on the Erie, is attending the convention. Mrs. Hayes is with him and they are stopping at the Chelsea. Other officers of the Traveling Engineers' Association who are, or have been, in attendance at the convention this year are, W. O. Thompson, secretary; C. B. Conger, treasurer, and F. C. Thayer and V. C. Randolph, of the executive committee.

V. C. Randolph and L. R. Laizure, master mechanics of the Erie, are stopping at the Pennhurst. Mr. Randolph read a report on "Practical Instruction in Fuel Economy" at the Traveling Engineers' Association which attracted great attention, in fact, marked the high point of the convention. He was also elected on the executive committee of that association. The Erie method is to have supervisors of locomotive operation on each division to see that the enginemen are given practical instructions on fuel economy.

W. C. A. Henry, superintendent of motive power, Southwest system, Pennsylvania Lines West of Pittsburg, is attending the meetings of the Master Mechanics' Association. He is much interested in the subject of stokers and states

E. F. Cook, Assistant Vice-President of the Union Tank Line, Chatting with Friends.

that the underfeed type has almost ceased to be a matter of special interest on his system. There are now so many in successful use that the engine crews are not looking on them as a novelty or experiment. He is building a stoker instruction car, to be used in much the same way as an air brake instruction car is now used.

W. S. Moseley, chief draftsman of the Carolina, Clinchfield & Ohio, is among the special guests at the convention. The Mallets which have been in service on that road for some time are giving splendid results. Tests were made shortly after these were introduced and while the enginemen were not accustomed to handling them. In spite of this, they showed much greater efficiency than the consolidations. It is proposed to make another series of tests in the near future. The road is specially favorable for making tests of this nature because of the long uniform grade over which the trains are operated.

Eleven representatives of the Illinois Central have attended, or are in attendance at, the conventions this year. They include C. F. Parker, vice-president; M. K. Barnum, general superintendent of motive power; R. W. Bell, superintendent of machinery; J. M. Borrowdale, superintendent of the car department; Willard Doud, shop engineer; E. W. Jansen, electrical engineer; L. P. Streeter, air brake engineer; J. S. Sheafe, engineer of tests; C. A. Shaffer, general

J. W. Storey, Chief Draftsman, Central of Georgia.

inspector of shop tools; H. C. Eich, master mechanic; and Gus Reifsteck, secretary to Mr. Barnum.

As everybody knows, the initials of chairman Mitchell of the entertainment committee are "P. J." Through somebody's mistake, they were given on his official badge as "P. R." "Pennsylvania Railroad Mitchell," said a man who was looking at the badge yesterday. "They'll read it 'Pretty Rotten Mitchell' before we get through down here, I'm afraid," replied the chairman, referring to the expurgated entertainment programme. However, nobody but Mr. Mitchell is worrying about his administration of the entertainment features. Special conditions require special resources, and he has admirably adapted himself to the situation as it is.

Maham H. Haig, Mechanical Engineer of the Sante Fe.

The Exhibit.

The Gold Car Heating & Lighting Company, New York, has been demonstrating, at its booth, the new Ideal pressure reducing valve for car heating. It is claimed for the regulator that when once set it will not vary.

The new combination body and truck bolster car which has been shown among the track exhibits by the Mid-Western Car Supply Company, Chicago, will be routed to Chicago via the Reading and Lackawanna roads, leaving Atlantic City Thursday. The car will be tested at Chicago.

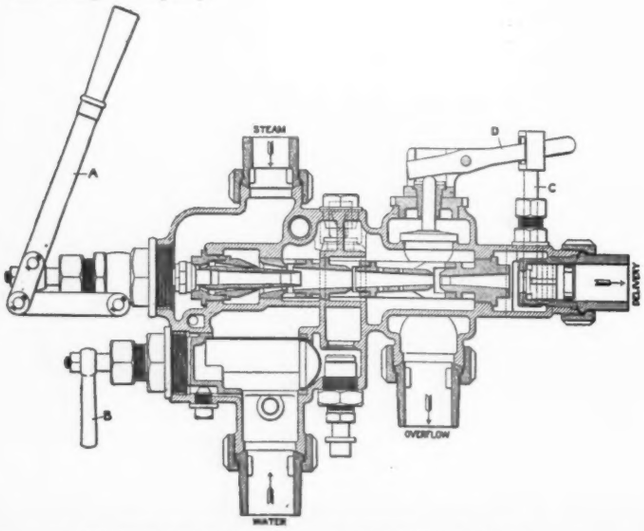
The Acme Supply Company, Chicago, at spaces 572 and 573, is making the first exhibit of Chanarch car floor plates. These plates are used with any of the composition floorings usually found in up-to-date passenger equipment. Chanarch automatically anchors the composition and weighs less and requires less composition than other floor plates, thus effecting a saving not only in cost, but operating efficiency. The Acme company will enlarge its plant on West Lake street and largely increase its output.

INJECTOR WITH AUTOMATIC OVERFLOW VALVE.

Since the invention of the injector by M. Giffard there has been a constant endeavor to improve its design and construction in accordance with the tendency toward increased boiler capacities and higher steam pressures. The first non-lifting injector manufactured by the Nathan Manufacturing Company, New York, consisting merely of a body and a set of nozzles, was followed by lifting injectors of the fixed nozzle type, the restarting type and of the non-lifting type, in which all operating parts necessary to start, regulate and stop it were contained in the injector itself.

All these types have their advantages, but also have weaknesses, one of which is the tendency to spill water at the overflow when the temperature of the feed water becomes higher than is suitable to the characteristics of the injector. This tendency has been overcome, in most cases, by what are called closed overflow injectors, in which the overflow is closed by hand-operated devices. This arrangement is unsatisfactory, and under certain circumstances may even be dangerous, because, if the jet is broken, the steam is blown back in the water tank, and, if it is not noticed, the water in the tank will soon become too hot to be handled.

All difficulties and uncertainties of this kind have been overcome in the D. and M. type injector, illustrated herewith, which represents an entirely new departure in injector construction shortly to be introduced by the Nathan Manufacturing Company.



Nathan D. & M. Type Locomotive Injector.

This new type is, in general, simliar to the restarting type of Simplex instrument, but includes an automatic closing and opening overflow valve. Letter *A* designates the ordinary starting lever, operating in the usual way, and *B* indicates the water valve by which the admission of water is regulated according to requirements. The injector is provided with the usual overflow valves and an auxiliary inlet valve. In the delivery chamber, moving in a suitably packed stuffing box, a small piston, *C*, which actuates a fulcrumed lever, *D*, that at the proper time acts on the overflow valve.

When the injector is started, the pressure in the delivery chamber slightly raises the piston, *C*, and the lever *D* bears down on the overflow valve and keeps it closed. Should the injector break from some cause, such as shortage of water, the pressure under the piston ceases and the overflow valve will open automatically. The injector then restarts automatically as soon as the water supply is restored. Closing the overflow is automatically repeated after the injector is again started.

This injector thus combines within itself the advantages of both the closed overflow and the open overflow injector, and entirely eliminates the disadvantages of the forcibly closed overflow. In view of the overflow being closed automatically, the injector is enabled to work feed water as hot as any type of injector with a hand operated overflow valve.

CUTTING COMPOUND.

An oil that is a distinct departure from the ordinary cutting compounds, is being introduced by Flint & Chester, Inc., New York. Contrary to the general characteristics of oil it thoroughly mixes with water and forms a solution that has all the advantages of water and at the same time the lubricating qualities of oil. It is known that a globule of water will resist a greater pressure than an oil globule, the difficulty in employing water as a lubricant being its lack of viscosity, or ability of globules to cling together.

As a mixture of from 10 to 20 parts of water to one of oil, depending on the character of work, forms the cutting compound, the cost of the mixture per gallon is small and it has the added advantage of cheap handling and storage, for the freight charges on and space occupied by one barrel of the oil cover a final mixture from 11 to 21 barrels. This oil is also valuable for hydraulic machinery. By using from 50 to 75 parts of water with one of oil it forms a preservative for the machinery as well as a lubricant.

The mixture does not give off the usual disagreeable odor when heated; it prevents rust, permits of heavier cuts being taken, and has healing instead of the poisonous qualities.

THE WESTINGHOUSE EXHIBIT.

Contrary to the practice of previous years, the several Westinghouse companies have had no working exhibit, their booth in the entrance hall being tastefully furnished as a place where members and guests of the convention could meet and talk. However, Westinghouse motors with control are being used in connection with the machinery exhibits of the following concerns: American Tool Works, 3 h.p. "CCL" motor driving a 2 ft. geared radial drill; a 20 h.p. "CCL" motor driving a 6 ft. radial drill. Baker Brothers, an "SK" adjustable speed DC motor on a 1 in. x 6 in. automatic drilling machine. Bethlehem Steel Company, two "CCL" motors operating a stress testing machine and a staybolt vibrating machine. Bullard Machine Tool Company, a 20 h.p. "CCL" motor on a 42 in. vertical turret lathe. H. H. Hewitt, two type "R" direct current motors on truck. Manning, Maxwell & Moore, Inc., an "SK" motor with drum type controller mounted on a Reed lathe, and an "SK" motor driving a National multiple spindle topping machine. Special attention is called to the automatic starter with this motor. Clement Street, two Westinghouse air brake motor-driven air compressors. Vixen Tool Company, a "CCL" motor driv-

ing a file testing machine. Yale & Towne Mfg. Company, two direct current motors operating hoists.

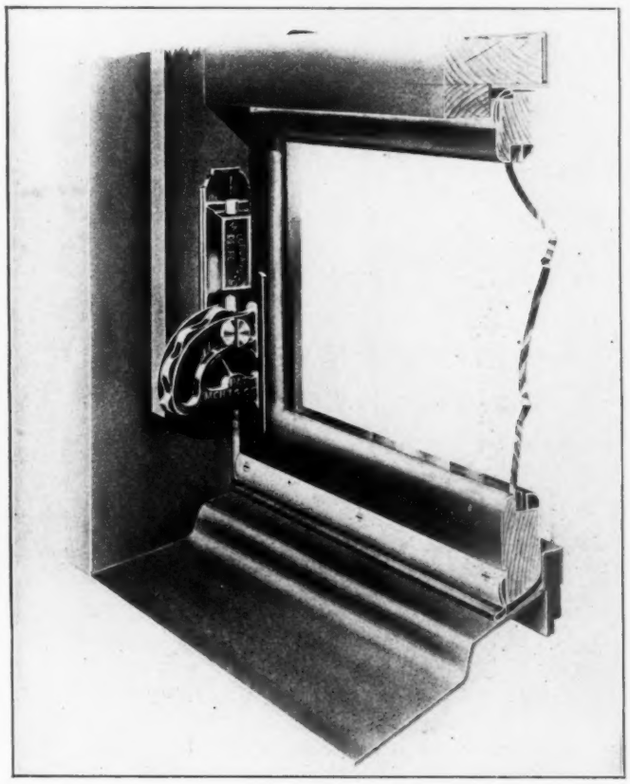
The booth is well lighted by 15 Westinghouse "Wire Type" lamps.

A NEW ELECTRIC DRILL.

There is an attractiveness to doing things by electricity that appeals to the imagination and the practical instincts of most people; hence the innate attractiveness of the electric drill shown by the Independent Pneumatic Tool Company, Chicago. It is not a very heavy affair, but it is good for holes in steel up to about 9/16 in. diam. There is a light shell carrying the fields, and revolving inside is a small armature. The shaft carries a pinion that meshes with a couple of gears which are pivoted on an arm attached to a sleeve serving as the drill spindle. The gears also mesh with an inside gear on the shell, so that as the pinion causes the gear to revolve they walk around and carry the drill spindle with them—a very simple and very old gear arrangement put to new uses that cuts the rate of rotation of the drill spindle relatively to armature shaft down in the ratio of one to nine. It is so simple that it seems strange no one has done it before. Then, with roller bearings and good workmanship, there are all the elments of ease of manipulation and satisfactory execution of work.

UNIVERSAL DECK SASH RATCHET.

Some things do seem too simple to exist. Take the old corrugated deck sash ratchet, for example, that was once used almost universally. The trouble was, that when it wore on its pivot it would slant and drop out of place. The McCord Mf'g. Company, Chicago, took it and put a



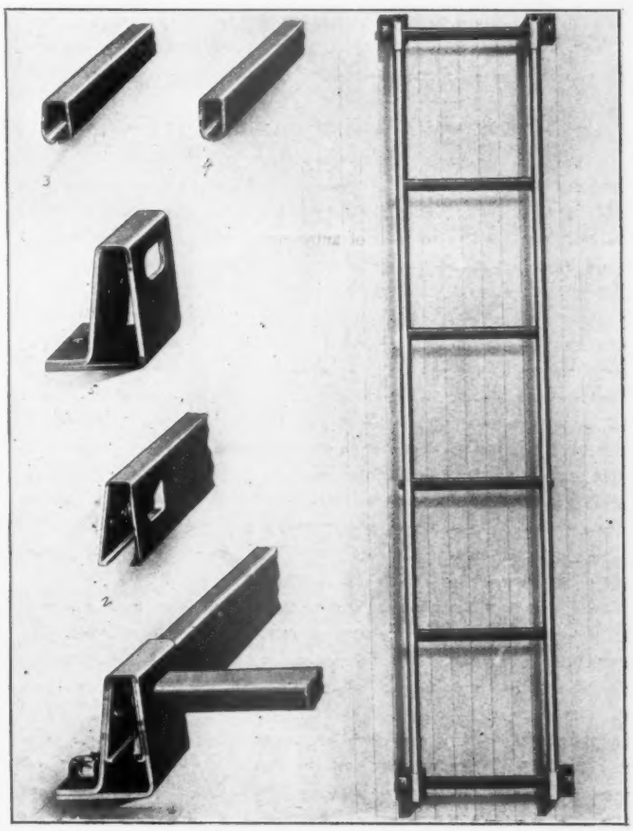
Universal Deck Sash Ratchet.

ridge along the inside, a sort of guard rail, as it were, for the spring stem, and a big-headed pivot pin to keep the thing in line—and there you are. The pin can't run off the track, because of the ridge and the ratchet can't wabble and get out of line; and so there are no more deck sashes coming down on the car floor, and no more sticky ventilators; while an abundance of fresh air is easily obtainable.

STEEL BOX CAR LADDER.

A box car ladder made of pressed steel is shown in the illustration. It consists of two continuous stiles, and required number of treads, and four straps fitted over the stiles for attaching to the car. This ladder, manufactured by the Acme Supply Company, Chicago, Ill., fulfills the specifications of the Interstate Commerce Commission. It is light in weight and ample in strength, and is attached to the car by only four bolts.

The stiles are made of inverted "U" shapes, with legs



Steel Box Car Ladder.

formed over ¼ in. along the edges. This allows complete access of air to all parts, preventing corrosion, and the shape provides ample strength. The length is made to suit conditions. The hole for the insertion of the tread is provided with a continuous ledge of ⅜ in.; thus providing a solid bearing for each tread in the stile. The depth is 2½ in., its width at the top ¾ in., and at the base 1¼ in. It is made of steel 1/16 in. thick.

The treads are formed so that there is a space left open, which is closed when the tread is fitted into its position in the stile, providing a spring fit of the tread which securely holds it in position. The shape of the tread not only furnishes a very good grip for hands and feet, but also makes an unusually strong construction. The depth of the tread is 1¼ in., and it is ¾ in. wide, and made of steel 1/16 in. thick.

The straps are attached to the stiles by means of rivets, and are further held in place by the tread, which engages the stile and strap at the same time. The strap holds the stile out from the car, and thus allows free access of air all around the ladder, and also permits of easy inspection. The strap is bolted through the sheathing of the car by

means of a ½-in. bolt, and has a total depth of 3¾ in., and a total base of 2 15/16 in. It is 3 in. long and is made of steel ⅛ in. thick. The toe of the strap can be turned either outward or inward as desired.

In a five-round ladder a tie-rod is placed from one stile to another through the tread at the middle. On a six-round ladder it is placed at the third tread from the bottom, as shown in 1. To make repairs it is only necessary to take out the tie-rod and two strap bolts and one stile can be completely removed. This ¼ in. bolt also serves as a tie-rod when the ladder is completely assembled and applied to the car.

The parts are made standard, so that repairs can be very easily made; they can be furnished upon receipt of dimensions as to length, etc. Any part can be placed in position in the ladder by simply removing the tie-bolt and two of the strap bolts, which permits the removal of one stile completely.

The approximate weight of the five-round ladder is twenty-five pounds, and of the six-round ladder thirty pounds.

AUTOGENOUS WELDING AND CUTTING.

During one week $216.36 was saved on various repairs in a western railway shop by the use of autogenous welding and cutting, with an additional saving of time which it would have required to get new parts, etc.

The cost of oxygen and the facility of getting it is naturally a great factor in this work. The International Oxygen Company, New York, offers a system for making oxygen right at one's works that is unique for simplicity, and the cheapness of the gases produced. Hitherto, to obtain oxygen, it was necessary to have a chlorate of potash plant, or to bring the gas in cylinders from some distant point. In either case the cost is rather high. At present it is claimed that oxygen can be made by the I. O. C. system at a saving of more than 75 per cent. over the old methods.

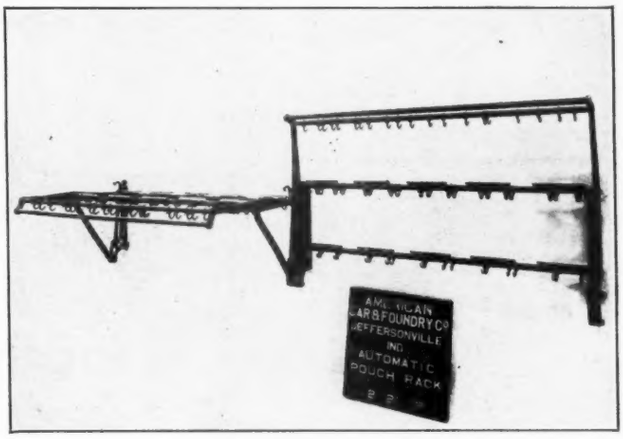
The International Oxogen Company has a 4-cell plant at Booth 307, which produces 12 cu. ft. of oxygen and 24 cu. ft. of hydrogen per hour, at an expenditure for power of 4 k.w.h. The plant requires no expert attention. Once started, the generators can run continuously for days and months, or even years; no replacing of parts and no repairs of any kind are required.

In addition to the oxygen produced by the I. O. C. system, 2 cu. ft. of hydrogen are produced for every cu. ft. of oxygen. The combination of these two gases gives the best flame for cutting purposes. Steel and wrought iron up to 24 in. in thickness can be cut by the oxy-hydrogen flame, which for cutting operations has proved superior to the oxy-acetylene flame. Oxy-hydrogen is used to great advantage in welding thin sheet steel, copper, brass, aluminum and all alloy metals; the oxy-hydrogen weld is said to be stronger and more elastic. Another important method of welding is the oxy-hydrogen-acetylene combination. These three gases together give an ideal flame, neither carbonizing nor oxidizing, and for this reason is suitable for a great variety of welding operations.

The I. O. C. system has been in use abroad for over ten years. The economy realized by this method in the cost of oxygen and hydrogen is large enough to pay for an installation in less than two years.

AUTOMATIC POUCH RACK.

The government is getting mighty particular these days, and especially as to the fittings of its postal cars. Pouch racks must be just the right size and shape; and weight that is excessive must be avoided. So the American Car & Foundry Company, St. Louis, Mo., has brought out a pouch rack that is light, has only ¼ in. between frames, and can be folded against the wall with all pouches hanging in place. It locks automatically open or shut, up or down,



Automatic Pouch Rack.

and has ample strength to carry its load. These racks may be seen at the booth of the company.

THE BUFFALO ADJUSTABLE BRAKEHEAD.

Whatever is wasted in brakeshoe scrap is real waste; and a pound or two is a pretty big percentage of total scrap. Now, don't do it. Just take the old Christie key that you have used for a generation to hold the shoe to the head and make it in the form of a spring. Then you have a slot in the back of the head. Drive the spring key down through it so that it bears on the beam. This will form a friction bearing that will hold the head in place,

The Buffalo Brakehead.

but will still allow it to turn under pressure. Then fit your shoe and apply the air, and the head will turn until the shoe has such an even bearing on the wheel that a uniform wear is insured. And the head will hold that place until the shoe is worn out. No, it isn't a kink that we originated; but the new adjustable brakehead that is being exhibited by the Buffalo Brakebeam Company, New York, and shown herewith.

Railway Age Gazette

DAILY EDITION

Copyright, 1912, by the Simmons-Boardman Publishing Co.

Vol. 52. NEW YORK—JUNE 20, 1912—ATLANTIC CITY. No. 24f.

PUBLISHED EVERY FRIDAY AND DAILY EIGHT TIMES IN JUNE, BY SIMMONS-BOARDMAN PUBLISHING CO., 83 FULTON ST., NEW YORK.

CHICAGO: 417 South Dearborn St. CLEVELAND: Citizens Bldg.
LONDON: Queen Anne's Chambers, Westminster.

E. A. SIMMONS, *President.*
L. B. SHERMAN, *Vice-President.* HENRY LEE, *Sec'y & Treas.*
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Subscriptions, including 52 regular weekly issues and special daily editions published from time to time in New York, or in places other than New York, payable in advance and postage free:

United States and Mexico	$5.00
Canada	6.00
Foreign Countries (excepting daily editions)	8.00
Single Copies	15 cents each

Engineering and Maintenance of Way Edition and the four Maintenance of Way Convention Daily issues, North America, $1.00; foreign, $2.00.

Entered at the Post Office at New York, N. Y., as mail matter of the second class.

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WHILE satisfied and loyal shopmen are a tangible value to a railway, contented and earnest foremen are of even greater importance. In fact, in most cases, it is not possible to have the former without first having the latter. It is noticeable in visiting the different shops throughout the country, that a spirit of enthusiastic loyalty for their roads and both their superiors and inferiors exists among the foremen at some places and is distinctly absent at others. It will well pay the head of a department to occasionally consider broadly the fundamental conditions and see that no opportunity is present for discord to start, or, if it is already evident, to find where the fault lies. The fundamentals are not confusing or involved and can usually be summed up in the term "square deal" or justice. Are your foremen getting all that it is their right to expect? Are they receiving a compensation in keeping with their responsibilities and their relative position, or are there workmen under their direction who draw larger checks on pay day? Does each know definitely within what limits he is supreme and just the limit of the authority of those around him? Is each actually supreme in his dealings with those supposedly under his direction? Is the line of promotion clear cut and straight forward? Is courtesy present in the intercommunications of the department? If these questions can be answered in the affirmative, it makes no difference how much work you demand of them, they will be satisfied and loyal. If these conditions do not exist it is pretty certain that discord and dis' loyalty are present even if not yet evident.

WHAT can be done in saving fuel by very simple means is well illustrated by the experience of the Baltimore & Ohio during the past year. Five supervisors of locomotive operation were appointed with instructions to study conditions on the sections of the road to which they were assigned and to recommend to the division officers, operating as well as mechanical, changes in methods or practices that would save coal. The work of these five men was very largely responsible for a saving of 12 per cent. in the fuel bill in the first year the scheme was in operation.

IN visiting the machine tool exhibit and noting the record performances being demonstrated, it is wise to make a mental computation to determine the possible output per day or week and compare it with the amount of work you have to do in the same time. Not infrequently it may be found that one of these machines will easily do the work that now requires two tools and its purchase can be easily justified. Again it may be discovered that the capacity of the machine is so great that its services would be required less than half the time under your conditions and the recommendation of its purchase will seriously reflect on your judgment in the choosing of future tools.

THE discussion on the maintenance of Superheater Locomotives was as extended and interesting as that on Boiler Design, as it was made to include questions relating to the general advantage of superheaters, and even invaded the realms of poetry and inspired the chairman of the committee to quote from Emerson that familiar passage about "troubles that never arise." While the subject of the report is so general as to cover the maintenance of locomotives equipped with superheaters, the instructions to the committee limit the range of the investigation to the quality of metal for the cylinder and valve wearing surfaces, and especially to lubrication, while the extra cost of maintenance, due to the superheater fixtures themselves, was not considered. It is, perhaps, too soon to obtain correct figures as to the cost of maintenance of any of these details, as the average time the superheaters have been in use on most lines is one year or less. During this period the question of proper lubrication of valves and cylinders using steam at high temperature has been developing, and the most satisfactory results have been only recently obtained. It is very fortunate for the success of the superheater that the problem of lubrication has been solved so successfully and placed beyond further question. It is fortunate also that a satisfactory metal for cylinders, valves and packing and forms of construction have been found which will permit the locomotive to do its work regularly under conditions of high temperature. This much having been achieved, superheating as applied to the locomotive must be regarded as a very valuable improvement, and it now

remains to ascertain the cost of the maintenance of the superheater itself, covering a period when renewals are required. While this expense may be small compared with the economies obtained, yet it will in time form a real additional charge to locomotive repairs and maintenance which must be reckoned with.

LOSS OF POWER IN LOCOMOTIVE EXHAUST.

THE loss of power due to back pressure in the exhaust of locomotives has been given so little attention that it is doubtful if mechanical officers could state within a large per cent. what it amounts to for a given type of engine working under normal load for any speed, or the relation of this loss to the total useful power developed at the drawbar. The various efforts to increase the capacity of locomotives usually relate to something positive in the way of additional apparatus, or increased dimensions, but little effort is directed to the reduction of negative influences which, if accomplished, would be equivalent to a positive gain in power without an increase in the dimensions of the locomotive or an addition to its equipment. Any increase in the size of the exhaust nozzle which reduces back pressure has this effect, and any substitute for the exhaust as a means for producing drafts, if more efficient will be a positive gain. It is the general impression that the power lost in back pressure in a locomotive of average size may amount to 150 to 200 h.p., but we are hardly prepared to find that on some Pacific locomotives this loss is equal to 590 h.p. and on Mallet engines it exceeds 1,000 h.p. These losses are almost equal to the total useful power obtained from the average passenger and freight locomotive.

In the elaborate paper on Locomotive Drafting and Its Relation to Fuel Consumption by H. B. MacFarland, engineer of tests of the Santa Fe, presented at the recent meeting of the Railway Fuel Association, the loss in power due to exhaust back pressure is given for the principal types of locomotives now used on the Santa Fe. The figures for back pressure and power lost were obtained from actual tests and seem to be unusually high, especially those for oil-burning locomotives. The test of the balanced compound Pacific type engine, showing the excessive back pressure already quoted, was in regular passenger service and burning oil. The loss in horsepower due to cylinder back pressure was 440 h.p. at 40 miles per hour and 590 h.p. at 50 miles per hour. On a somewhat larger simple Pacific type engine burning coal the back pressure horsepower at 40 miles per hour was 270, and at 50 miles per hour, 340. The greater loss with the compound engine is due to the greater area of the low pressure piston on which the back pressure acts, and this power loss should be in the ratio of the piston areas, other conditions being equal.

This limitation of the power of large locomotives by excessive back pressure on the cylinders is a subject which should be thoroughly investigated, as it is a large factor in their economical operation. It is not possible to operate non-condensing engines without at least 4 lbs. back pressure, but the loss due to excessive pressures beyond that is due to the inefficiency of the exhaust nozzle and smoke-box appliances for producing draft.

The actual power required to draw the gases through the tubes of a large locomotive is only about 20 h.p., and the resistance of the diaphragm and netting adds 8 h.p., making a total of 28 h.p. The resistance at the ashpan of oil-burning engines is much greater than that through the grates of coal-burning engines on account of the restriction of the air passages in the present methods of construction of oil-burning on locomotives.

Mechanical draft for locomotives has been frequently proposed, and was actually used as early as 1835 by Segiun, the inventor of the multi-tubular boiler. Since that time the experiments made in this direction have been with inefficient fans and comparatively slow speed reciprocating engines for driving them. The great improvements which have been made in the efficiency of blowing apparatus in recent years, and the possibility of driving such apparatus direct-connected by economical steam turbines, render the conditions for success far more favorable. Mr. MacFarland has already demonstrated that it is possible to produce sufficient draft for a large locomotive by the expenditure of 50 h.p. with a mechanical combination of this kind, and is now arranging for special equipment for application to a locomotive in regular service.

WHEEL FLANGE LUBRICATION.

FLANGE lubrication is effective in greatly reducing flange and rail wear on divisions where curves are sharp or frequent; it does not effect the adhesion of the locomotive if properly applied and maintained, and it does not have sufficient effect on train resistance to make it a factor in tonnage rating. These are, briefly, the conclusions of the committee which reported on this subject at Wednesday's meeting. It seemed to be in full agreement with the experience of all the members that have any extensive trials.

General practice favors the application of the lubricant to the flange of the leading driver. It should be of a quality that will form a thin paste which will be partially transferred to the side of the rail head and from there to the flanges of the following wheels. The committee stated that the effect of the lubricant decreased very rapidly as the distance from its point of application increased, but it seemed that this was not sufficient to lead to the recommendation of more than one lubricator on each side of the locomotive.

In cases where the flange oilers have been extensively applied, savings of considerable size were reported by both the committee and the members discussing the subject. Mr. Gaines stated that on a division where all the locomotives were equipped, a saving of at least $50 per locomotive per year is being made from the reduced loss of metal from tire turning alone. The committee reported a net savings of $84 per year per locomotive on one road. It seemed that the mileage of tires between turnings can usually be doubled where conditions are ordinarily favorable to the use of the lubricators and quadrupled where severe curves are frequent. One number reported an increase from 12,000 to 50,000 miles between tire turnings.

The question of the effect of flange lubrication on the brakes when descending long grades brought forth no evidence that any serious result of this kind had been noticed. This feature, as well as the effect on the adhesion of the locomotive, is largely dependant on the proper design and application of the lubricators, but principally on its maintenance. If oil is permitted to get on the tread of the driver or top of the rail considerable trouble with both slipping of drivers and sliding of wheels can be expected.

The question of the effect of flange or rail lubrication on the adhesion of the drivers and, therefore, on the traction power of the locomotive is one which does not appear to have been fully investigated, and it is easy to realize that if this lubrication is not properly controlled it might decrease the hauling power of the engine to a considerable extent.

There seems to be a general impression that if the lubrication is confined entirely to the flange there can be no effect on the adhesion of drivers, but this assumes that adhesion is only obtained by the pressure of the tread of the wheel on the rail head, which is hardly tenable, for where there is wear there is also friction, and driving flange friction on curves must be a part of the adhesion which is essential to traction power.

In the further investigation of the flange lubricator this phase of the question might be considered, and a conclusion as to the real effect of definite flange lubrication on the traction power of locomotives working on curves, as based on dynamometer measurements, should be stated.

Proceedings.

Vice-President Crawford called the meeting to order at 9.55 a. m.

FLANGE LUBRICATION.

The committee reporting last year on the subject of flange lubrication has been continued to make still further report to the 1912 convention and the original committee has been increased from three to five members.

Since closing the 1911 report advice has been received of flange lubricators having been applied by over thirty roads on which lubricators had not been used previously. In most cases reported, the number of locomotives equipped on each road has been small. In one instance, however, a road operating over 1,100 locomotives has applied flange lubricators to the entire number.

On a number of other roads on which flange lubricators were used at the time of preparing the last report, the application

M. H. HAIG,
Chairman, Committe on Flange Lubrication.

has since been extended. The reports of thirty-five of these roads show an average increase of thirty lubricators each, the number per road varying from one to over two hundred.

An affirmative answer to the question "Does your experience confirm the report on flange lubrication presented at the last convention?" was received from twenty-three of the twenty-nine roads replying in detail to the committee's circular. Five of these roads explained that failure to answer was due to lack of sufficient experience.

The types of lubricators applied during the past year indicate the most general adoption of crude oil as a lubricant. Some reports state that hard grease has been rejected as unsatisfactory, due to the fact that the grease catches and holds sand. The abrasive action resulting has increased instead of decreased the flange wear. Graphite as a flange lubricant has been reported as successful by some roads but others have abandoned it for crude oil. Crude oil with a heavy asphaltum base is spoken of with the greatest favor by roads using flange lubricators. It has been successfully applied by both hydrostatic and gravity-feed devices. Exhaust steam from air pumps as well as water jets are still being used to a limited extent by some railways and beneficial results are reported. An undesirable feature of the water jet is the fact that it must be abandoned during the winter weather.

A type of lubricator especially adapted to electric locomotive service has been developed on the Grand Trunk by W. D. Hall, superintendent of power plant and electrical equipment. This lubricator has been designed to meet the requirements of service through the St. Clair tunnel. Fig. 1 is a sketch illustrating the principle by which this lubricator is connected and operated. Oil is contained in an air-tight receptacle of one quart capacity. The oil is led to the wheel flanges by pipes and is sprayed upon the flanges by jets of air. The air is supplied from the main reservoir by a ¼-in. pipe connected to the oil receptacle above the surface of the oil. This provides a pressure to force the oil from the receptacle. A branch of this pipe is connected to the oil delivery pipe leading to the flanges. The oil is thus forced through the pipes and sprayed upon the flanges.

Used with electrical equipment, the air is controlled by an electric push-button. Valves admitting air above the surface of the oil, as well as to the delivery pipes, are operated by electromagnets. The push-button is located in easy access of the engineer and oil is sprayed upon the wheel flanges almost

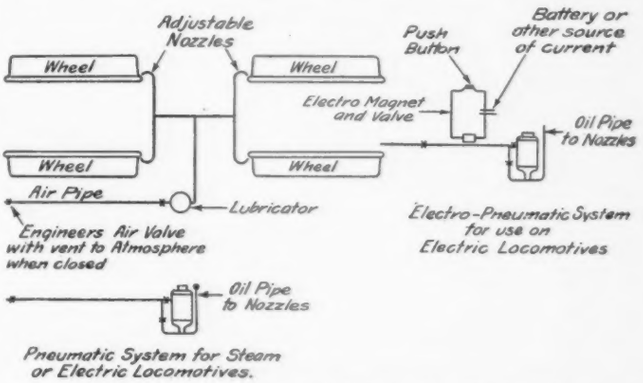


Fig. 1—Pneumatic Flange Lubricator for Electric Locomotives; Grand Trunk.

immediately upon the admission of air pressure. With this arrangement flange lubricant is applied only when needed and when running on straight track the lubricator is not continued in operation.

This apparatus has been in successful operation since July 10, 1910, and has operated under extremely severe conditions. Six electric locomotives have been equipped and handle 1,000-ton trains up and down 2 per cent. grades. Owing to the many curves encountered and also because of the rather slow center of gravity of the locomotives, flange wear has been quite heavy. Since applying this lubricator the conditions have been improved to such an extent that 50,000 miles and over are made between turnings and it is seldom necessary to remove wheels for tire turning before the armature is removed for commutator dressing, and these two operations may, therefore, be performed at the same time.

Before the application of the lubricator, mileage made between tire turnings was from 12,000 to 25,000. The lubricant used is engine oil, most of which is taken from bearing cellars of the railway armatures when the oil in them is being changed. The oil is filtered before being applied to the flange lubricators. No difficulty has been experienced with the delivery of this oil in cold weather. It is sometimes thinned to suit the weather conditions by the addition of a little coal oil. Care has been exercised in keeping the oil free from anything that might obstruct

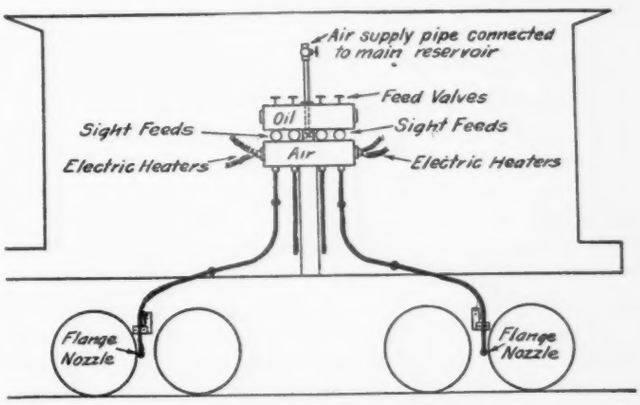


Fig. 2—Electric 4 Pneumatic Flange Lubricator for Electric Locomotives.

the nozzle and very satisfactory results have been obtained under varying and severe weather conditions.

Fig. 2 is a diagram showing the application and principle of operation of an air-operated flange lubricator for electrical equipment, manufactured by the makers of an hydrostatic flange lu-

bricator for steam locomotives. The lubricator is located in the cab as with the hydrostatic device, and sight feeds indicate the rate of formation of the drops of oil. An electrical heater is included in the equipment and the temperature of air and oil is raised by passing through this heater. The air supply is from the main reservoir. Oil is led to wheel flanges by pipes as with the hydrostatic lubricator and is sprayed upon the flanges by air instead of steam. This lubricator is designated by the manufacturers as the "Electric 4." It has been placed in service on electric locomotives of the Baltimore & Ohio and the Pennsylvania.

The Collins flange lubricator illustrated and described in the former report has since been improved. The improved device is similar in construction to that already described. The feeding device of the original type was placed under the body of the lubricator. The lubricating block of graphite composition was pressed against the flange by a pawl engaging in notches in the under side of the block. With the improved type a coil spring and plunger acting directly behind the block of lubricant presses it against the flange, the feed being continuous without adjustment until refilling is necessary. The 1911 report has given the impression that this lubricator was designed to use hard grease. It should be stated that the lubricant is graphite.

Among the simple devices operated by some of the railway companies is one which can be built up of pipe fittings and has been used to apply either hard grease or graphite. The device consists of a short section of 1¼-in. pipe capped at one end and containing a piston actuated by a spiral spring. A small rod threaded into the piston extends through the cap, not only assisting to guide the piston but also indicating the amount of grease in the lubricator. This device is clamped to the frame of the locomotive in front of the drivers and feeds the lubricant directly against the flange. When using ordinary rod grease the lubricant is contained in a section of scrap rubber hose and is deposited as the hose is worn away.

The Pittsburgh & Lake Erie has applied this lubricator extensively, using a mixture of paraffin and graphite as the lubricant. This is contained in a wooden block turned up in a lathe, the cavity for the grease being bored out 1 inch in diameter. The practice of this road has been to apply a lubricator to each wheel which has shown wear or cutting. After the flange has been worn smooth it has not been considered necessary to operate the lubricator until further signs of cutting develop. Some difficulty has been reported as to keeping this device in proper adjustment at all times.

The result of a test of flange lubrication on a number of twelve-wheel locomotives of the Norfolk & Western is contained in the 1911 report. This test led to the conclusion that with track conditions as existing on this line, flange wear was too slight on freight engines to warrant the practice of lubrication. Five Pacific type passenger engines have since been equipped with lubricators for test purposes. The equipment includes three types of lubricators—hydrostatic, gravity and graphite. The comparative mileage between tire removals before and after the application of the lubricators is shown in Table 1. It will be seen that the average service per front tire removed from these engines before the lubricators were applied was 16,518 miles, while the average for the same engines since the lubricators were installed has been 39,909. The former figures are taken from the record of 25 tires removed, the latter from the record of 10 tires removed. The local authorities providing the data suggest that this result may have been affected in some measure by a lateral spring arrangement applied to the trailer trucks to prevent nosing. They state, however, that they consider the improved condition to be due to lubrication and not to the spring.

TABLE 1.

MILEAGE SERVICE OF FRONT TIRES REMOVED FROM PACIFIC TYPE ENGINES TO FEBRUARY 1, 1912.

NORFOLK & WESTERN.

After Equipped with Oilers. Mileage.			Before Equipped with Oilers. Mileage.		
Eng.	Right Side.	Left Side.	Eng.	Right Side.	Left Side.
564	63,141	63,141	564	26,702	26,702
Average miles per tire, 63,141. Tires removed, 2.			Average miles per tire, 26,702. Tires removed, 2.		
569	27,889	27,889	569	13,175	13,175
569	39,582	39,582			
Average miles per tire, 33,735. Tires removed, 4.			Average miles per tire, 13,175. Tires removed, 2.		
571	26,728		571	17,204	17,204
571		43,512*	571	6,845	6,845
			571	12,096	12,096
			571	16,784	
Average miles per tire, 35,120. Tires removed, 2.			Average miles per tire, 12,725. Tires removed, 7.		
572	No tire renewals since oilers applied.		572	15,846	15,846
			572	24,553	24.553
573	33,816	33,816	572	24,297	24,297
			572	14,640	14,640
			Average miles per tire, 19,834. Tires removed, 8.		
			573	17,972	17,972
			573	15,618	15,618
Average miles per tire, 33,816. Tires removed, 2.			573	9,139	9,139
			Average miles per tire, 14,243. Tires removed, 6.		
			Average miles per tire, all engines, 16,518.		

Average miles per tire, all engines, 39,909.

*Includes four months' mileage before oiler was applied.

Fig. 3 shows the contour and mileage records of a decapod locomotive on the Buffalo, Rochester & Pittsburgh. Previous to the application of the lubricator this engine had made 31,529 miles with the flanges worn as shown by the dot and dash contour lines. After making 21,102 miles with a hydrostatic oiler in service the condition of tires was as shown by the dotted contour lines.

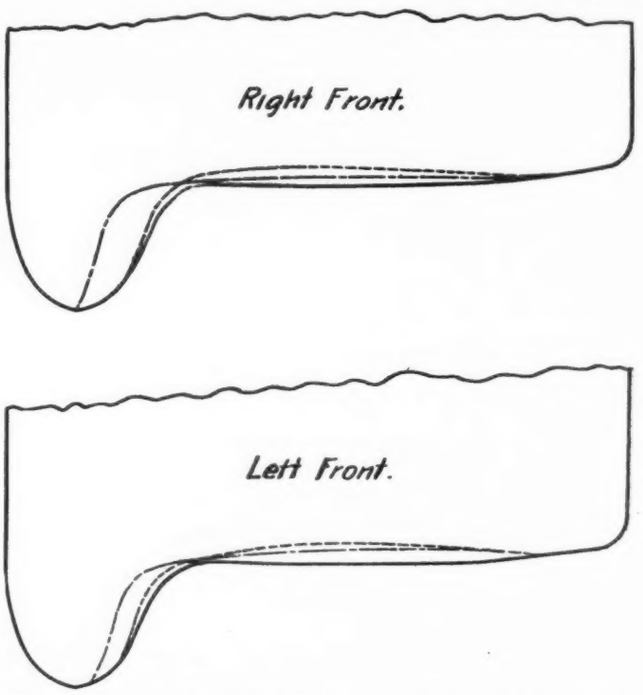


Fig. 3—Tire Contour Taken from a Decapod Locomotive, B. R. & P.

Full lines, standard tread and flange as received new from builders, Sept., 1909, also represents new tires applied July 28, 1910, at which date the Chicago Flange Oiler was applied.

Dot and dash lines, tread and flange July 28, 1910, after making 31,529 miles (previous to applying flange oiler).

Dotted line, tread and flange March 9, 1911, after making 21,102 miles (Engine equipped with Chicago Flange Oiler).

Contours taken from Plaster Paris casts.

The Hocking Valley Railway reports that the service of switch engines operating upon industrial tracks with much sharp curvature has been increased from 4 months to 12 months. On consolidation engines subject to excessive wear of front and back flanges the service of tires has been increased from one year to two years. At the end of this period the flanges are still in good condition.

In Table 2 is shown the estimated saving in cost of fires effected by the use of flange lubrication on the St. Louis & San Francisco. This is based upon experience with consolidation engines equipped with hydrostatic oilers using asp altum oil.

TABLE 2.

SAVING IN TIRES ON CONSOLIDATION LOCOMOTIVES EQUIPPED WITH FLANGE LUBRICATORS.

ST. LOUIS & SAN FRANCISCO RAILROAD.

Value of new 56-in. tire, 3½ in. thick	$30.80
Less scrap metal in tire	2.45
Net value of wearing metal	$28.35
Net value per sixteenth, figuring on 28 sixteenth, wearing metal	1.01

Average loss of metal account flange wear after one year's service if tires have been changed three times.....9/16 in.	
Average tread wear.....5/16 in.	
Average loss of metal account flange wear.....4/16 in.	
4/16 in. at $1.01 per sixteenth.....	4.04
Loss on consolidation engines, eight tires at $4.04 each.....	32.32
Cost of changing tires three times.....	70.86
Total loss account flange wear.....	$103.12
Deduct:	
45⅝ gallons at 25 cents.....$11.41	
Storehouse expense and cost of handling flange oil..... 2.28	
Interest on flange oiler and material used in equipping engine 5.40	
Total deductions	19.09
Net saving per consolidation engine equipped with oiler per year	$84.03

Comparative mileage of two classes of locomotives of the Queen & Crescent Route is shown in Table 3.

TABLE 3.

MILEAGE MADE BETWEEN TIRE TURNINGS BEFORE AND AFTER THE APPLICATION OF FLANGE LUBRICATORS.

QUEEN & CRESCENT ROUTE.

Consolidation Type.

BEFORE.		AFTER.	
701	22,855	705	44,387
703	18,293	707	43,230
706	16,211	712	51,255
704	26,026	716	45,344
709	25,755	720	42,205
716	25,246	721	43,352
717	24,273	726	40,340
732	18,897	729	44,226
736	24,823	733	42,394
737	27,961	737	43,738
Total	230,335	Total	440,471
Average .....23,033 miles.		Average .....44,047 miles.	

Pacific Type.

BEFORE.		AFTER.	
800, 11-1909 to 6-1909....	36,154	800, 6-1909 to 10-1910....	76,890
801, 12-1908 to 6-1909....	19,743	801, 6-1909 to 10-1910....	96,918
802, 12-1908 to 7-1909....	46,466	802, 7-1909 to 11-1910....	96,470
803, 11-1908 to 8-1909....	56,722	803, 5-1910 to 9-1911....	97,137
	159,085		367,415
39,771, average before flange oilers.		91,854, average after flange oilers.	

Several roads report a noticeable reduction in tender truck wheel flange wear on engines equipped with lubricators. However, no data have been received to show the extent of reduction or influence upon wheel mileage.

The question of saving in rail renewals and decreased train resistance to be realized from lubrication of rails on curves has been carefully investigated by the Pennsylvania Lines west of Pittsburgh. Tests to determine the reduction in rail wear to be obtained by lubrication were made on curves 3 deg. 20 min. and 10 deg. respectively. The rails on the first half of the curve to be traversed were not lubricated and those on the last half were lubricated by hand. We quote the following from the conclusions of the Pennsylvania Committee: "The data collected shows that with lubrication there would be considerable saving in rail and flange wear on roads with sharp curvature. . . . Our tests confirm a saving but show that for light curvature the saving is very little. The tests show very little more wear on curves up to 4 deg. than on straight line."

Records of rail renewal on the Southern Pacific in the Sierra-Nevada Mountains, where all of the locomotives are equipped with flange oilers, show that since the oilers have been in service the average life of the outside rail on all curves above 5 deg. has been increased from 12 months to 32 months, or 2⅔ times the life prior to the use of flange oilers. The average life of the inside rail on curves above 5 deg. has been increased from 13 months to 33 months, or 2½ times the life prior to the use of the oilers.

In this connection it should be stated that rails are now removed having a much smaller percentage of wear than those removed a number of years ago. In other words rails which are now considered unsafe for traffic, a number of years ago would have been allowed to remain in the track several months longer. Keeping this in mind the above figures, which have been abstracted from curve-worn rail reports, will be seen to be conservative.

Attention should also be called to the increase in average daily tonnage. The flange oilers have been in general use on the territory under consideration since May, 1908. For a period of three years prior to that date the average daily tonnage passing over these curves was approximately 15,000 tons. For the three years since that date the average daily tonnage has been 22,000 tons, an increase of 47 per cent. The increase in tonnage should increase the rail wear and in order to get at the actual increase in the life of the rail since flange oilers were put into use, this factor should be taken into consideration. Had the average daily tonnage remained 15,000 tons instead of increasing to 22,000 tons, the rail would have lasted 47 per cent. longer than it did, or practically a period of 48 months. This is nearly four times as long as the life of the rail prior to the use of flange oilers, considering conditions to have been the same in both cases.

Any agency whereby the wear of rail and flanges is reduced may be expected to affect train resistance on curves. This has been observed in the ease with which lubricated engines round curves, but it has not been of sufficient effect to lead to any increase of tonnage rating. It must be considered that the effect of lubricant applied to the flanges of the locomotive drivers decreases very rapidly with increased distance from the locomotive.

The committee of the Pennsylvania Lines, already referred to, continued its tests to determine the effect of flange lubrication on train resistance. A series of runs was made on a division with a grade north-bound of 90 ft. per mile and 60 ft. per mile south-bound.

About two-thirds of the track over the summit is made up of curves from 2 degrees to 6 deg. 45 min. The trains were hauled by a consolidation locomotive. The drawbar pull of runs made with oil lubrication applied to two pair of drivers and the truck wheels, and the runs with graphite applied to the gage side of the rail by brushes was compared with the drawbar pull without lubrication.

North-bound the trains consisted of the dynamometer car and 29 empty cars weighing about 605 tons. South-bound the trains consisted of the dynamometer car and thirteen loaded cars weighing from 915 to 951 tons.

The tests showed a reduction in drawbar pull with a loaded train of 951 tons, of 285 lbs., or about one-sixth of the drawbar pull for one loaded car. The reduction for empty cars was equal to about 1½ cars. The tests were not considered conclusive, however, on account of variable weather.

A similar set of test runs was made over another piece of track as nearly level as could be found with curves from 2 deg. 49 min. to 9 deg. 59 min. This was selected in order to eliminate, as far as possible, any resistance due to grade. The tests showed fairly uniform results and that there was slight decrease in curve resistance due to lubrication, but not sufficient to allow of another car being added to the train.

It is the practice of many roads, where curves occur on grades, to compensate for the curvature by reducing the grade. Where this practice is followed no decrease in curve resistance can affect tonnage rating.

The flange lubricator, like other devices, requires attention. Any defects or any imperfections in the device or its connections should be included by the engineer in his work report at the end of his trip. This work should be done by the enginehouse force and the enginehouse should be held responsible for repairs.

Engine crews should be held responsible for the performance of the lubricators and where repairs are maintained by the enginehouse the lubricators require comparatively little attention. In view of the economy in life of tires when flanges are properly lubricated, road foremen of engines should see that lubricators are kept in operation on the engines under their jurisdiction.

A good location for a lubricator is just opposite to the top frame rail. This should be far enough from the delivery end of the sand pipe to prevent water of condensation from collecting at the end of the pipe and freezing. In severely cold weather care should be exercised to prevent water of condensation from freezing in the delivery pipes of the hydrostatic lubricator. By keeping a sufficient flow of steam through the pipes this should be avoided. This steam can be throttled sufficiently to keep the pipes clear without emitting so much steam as to be annoying.

CONCLUSIONS.

Considering the previous report and the information upon which the present report has been based, the committee feels justified in the following conclusions: The value of flange lubrication depends upon local conditions. Flange lubrication has proven effective as a means of reducing flange wear, particularly on driving wheels. The effect of lubricant applied to driving-wheel flanges decreases rapidly as distance from locomotive increases. Flange lubrication results in considerable saving in rail wear when sharp curves are frequent. The effect of flange lubrication upon train resistance is not sufficient to make it a factor in tonnage rating.

The report is signed by:—M. H. Haig (A. T. & S. F.), chairman; T. W. Heintzleman (So. Pac.); D. J. Redding (P. & L. E.). A. Kearney (N. & W.) and W. C. Hayes (Erie).

M. H. Haig (A. T. & S. F.) presented the report and added the following: The committee reported to the convention last year and in doing so endeavored to cover the situation as fully

as possible, as developed at that time. It therefore now feels that its further duty lies in the recording of the developments in flange lubrication during the last year, the increase or decrease in flange lubrication, as well as reporting the further actual experience of the various railroads, thereby either confirming or refuting the previous report. Since last reporting, there has been some development in the line of flange lubrication for electric locomotives. Two lubricators for this class of work are described in this report. Some impression has been current that the oil used in flange lubricators which use oil as a lubricant, is provided also exclusively from a certain source. It should be pointed out for the benefit of all members that the oil is available in the most convenient market. It has been found, though, from experiment that the Kern River oil from the Bakersfield district of California, is the most satisfactory for the reason that it adheres to the flanges and forms a sort of paste that not only spreads over the flange, but is wiped off against the rail where it forms a coating. In the hydrostatic lubricator, the oil being a heavy body, will not separate when it comes in contact with steam.

Very often information of unusual interest is contained in the letters that the various members forward to committees, and while this information cannot always be given in full in the reports, I feel that a few quotations would be of interest. For instance, with regard to the delivery of lubricant to the rail. A member states that from personal observation in examining the ball of the rail after train has passed, and when the flange lubricator is properly operated on the engine, it is possible to see a slight indication of oil on the rail which he states proves that the ball of the rail was lubricated to a certain extent; a condition which should reduce wear of rail as well as wear of flanges.

Another member in answering the various questions advises that flange lubrication prolongs the life of the rail by one-third, and goes on to state that anything that will save the flanges will save the rail. With regard to comparative wear of flanges between turnings with and without flange lubricators, I refer to a statement made by a member concerning both passenger and freight equipment. He states that engines working exclusively in mountain service require tire change every 8,000 to 10,000 miles when operated without flange lubricators. He then refers to a ten-wheel passenger engine making 37,186 miles before turning tires, and to a Mikado freight engine which made a mileage of 21,152 miles up to the time of a wreck, and examination of the tires and flanges showed them to be good for, at least, 2 months more.

Another member advises that since the application of flange lubricators to a number of ten-wheel passenger locomotives, it has been possible to make from 65,000 to 85,000 miles per engine. With the same class of engine without flange oiler it has been necessary to turn tires on account of flange wear, after making from 25,000 to 30,000 miles. A number of replies indicate particularly satisfactory results with switch engines. Engines of this class work a great deal over industrial tracks in which the curves are sharp and frequent, and various reports indicate that the life of tires is much longer with flange lubricators than without. For instance, one member advises that the service of switch engines is increased from 4 to 12 months.

The committee was particularly anxious to see that all lubricators which had attained any success were described in this report. A short time before closing the report, we received word from one member of the association that he was using a Detroit lubricator. This lubricator is a gravity feed device. The tank is supported under the running board on one side of the engine and a pipe leads to one flange on each side of the engine. The valve which controls the flow of the oil is operated by a ball which receives its motion from the movement of the locomotive.

DISCUSSION.

C. A. Seley (C. R. I. & P.): I cannot understand what the third recommendation means.

Mr. Haig: The lubricator is naturally located on the locomotive. Usually it is located on the driving wheel, though occasionally it has been placed on the engine truck wheel. Instead of stating that the feed of the lubricant decreases as the distance from the locomotive increases, it might have been plainer had we stated that it decreases as the distance from the point of application increases; the lubricator naturally has its greatest effect on the wheel to which it is applied, inasmuch as it spreads the lubricant very fully over that flange. The flange conveys the lubricant to the rail, and as the train passes over that point each wheel picks up a little of the lubricant, so that by the time the last wheel of the train passes that point, it receives less benefit from the lubricant than the first wheel. The object is to spread a paste over the side of the rail, if possible, in order that not only the rail but all of the wheel flanges will receive some benefit.

F. F. Gaines (C. of Ga.): We have tried out pretty nearly everything in the way of flange oilers except the last one referred to by Mr. Haig, and we have boiled the matter down to the hydrostatic form of lubricator as being the only satisfactory lubricator. On one of our divisions we have had quite some considerable trouble, with our Pacific type engines, from the fact that the flanges would run sharp in the neighborhood of about 30,000 miles, practically, whereas after the application of the lubricator we find we can get about 60,000 miles. After equipping these engines with the lubricator, we find we can get 60,000 miles out of them, and figuring on the tire turning and loss of metal involved, and the labor and material, at $250 for each turning, the improved mileage means a very considerable economy, amounting to over $500 between each tire turning on these locomotives.

On another division we equipped the entire system with flange oilers, and our figures, while not showing the saving that some of the roads reporting show, averaged up to $50 an engine per year on this division, although our figures are not yet as complete as they might be, due to the fact that we have only recently got the whole division equipped. We expect to have more definite figures in the future. As an illustration, I will say that the value of tire loss on 8 tires, in the case of engines equipped with the flange oiler, was $74.88, whereas the value of tire loss on 8 tires, in case of engines not equipped with the flange oiler, the loss of material involved is $132.48.

H. C. VanBuskirk (C. & S.): Our road has had considerable experience with flange lubricators of different types, and as Mr. Gaines has just stated, the hydrostatic type of lubricator is the only one, among those we have used, which gives satisfactory results. Our experience has been principally on the narrow gage lines of the Colorado & Southern, where there are long curvatures and high grade lines. There is one question that has been asked, and that is whether there is any effect on the flange lubricator in the case of trains descending on a heavy grade. I can say from my personal observation that there is not. We have tried that with the hydrostatic type of lubricator, by putting sufficient oil on the flange, which will communicate it to the rail, and there is no effect on the braking power when descending on a 4 per cent. grade. There is no noticeable effect. I have tried a lubricator which uses the solid lubricant, and it will pick up sufficient foreign matter so that it will glaze over the surface and give no result on the flange. We have 30 deg. curves, and lots of them, on 4 per cent. grades, and the locomotives in connection with which we are now using the hydrostatic lubricator will run from one shopping to the next, whereas with the lubricator we formerly used, we could never get over 12,000 to 14,000 miles out of our locomotives. At the present time we are running in the neighborhood of 50,000 miles, and never have to take the locomotives out of service on account of flange wear. The gravity type of lubricator that we have been trying will go about 5,000 to 12,000 ft. elevation on one division in warm weather, but by the time we get at the top of a mountain the lubricator will not feed in the same manner, whereas the hydrostatic is under control at all times and will deliver the oil just as it is wanted.

R. D. Smith (B. & A.): The report of the committee at the last year's convention was such as to prompt us in trying these flange lubricators on some of our Pacific type engines; and the results that we have obtained have been very good. I have, however, heard a criticism of it since being here, with which we have not had any trouble, and that is, there is a slippage of the engine when starting a train, due to the spurting of the oil while the engine is standing. I mention this from a hydrostatic lubricator point. The results that we have obtained have been so good as to warrant us in extending their use.

Angus Sinclair: I think I was one of the pioneers in experimenting with flange lubrication. About 1880 I was running a locomotive on a small road. They had only one engine, and the road was very crooked and it ended with a curve of about 15 deg. or so, and I hadn't been running the engine but a short time when I found flange cutting going on. I was aware that if the engine failed, my job would fail, for they would not ever be able to buy another, and consequently I was very much interested in preventing this flange wear. My first natural impulse was to try a swab that we used for piston rods, but that proved unsuccessful as it also lubricated the tread of the wheel. I finally fell upon a scheme of a piece of graphite and grease mixed, and I was fairly successful with that. I was able to prevent the flanges from cutting, and not altogether without lubricating the tread, but still not to any great extent, and I saved my job through the lubricating device, and I was rather proud of it in those days.

S. L. Bean (Santa Fe Lines): We have in my territory about 2,500 miles of road. The longest tangent is 30 miles. We have increased our mileage from 60,000 miles in the passenger

service in one particular mountain district to between 100,000 and 120,000 miles, which is credited to our flange lubrication.

F. F. Gaines (C. of Ga.): Referring to the question brought up by Mr. Smith, relative to the objection to the hydrostatic lubricator on account of the accumulation of water in causing slipping, I would say that as near as we can find out, that where an engine stands for something like 10 or 15 minutes, we have noticed a little slipping in the first revolution or two; but in an ordinary passenger stop or any other stop where it does not exceed 5 minutes, it is practically unnoticeable.

L. R. Pomeroy: In 1886 when I was connected with the Suburban Rapid Transit Company, we had a number of Forney engines that were very much heavier than the type of Forney engine then in use on the elevated system. We had curves of 160 ft. radius, and in running those engines with the leading driver first, we had a great deal of trouble with flange wear, but the greatest trouble we had was the noise made in grinding around the curves. At that time I arranged a piece of ¾ in. pipe, 6 in. long, on the end of which was fastened a felt swab, and the pipe was filled about half full with oakum and a spring on top of it which kept a constant pressure on the oakum, and it was pressed in so hard, that there was no free oil dropped at any time, and yet it kept up a wiping action on the flange which not only relieved the noise, but reduced the flange wear very materially; and that was afterwards placed on all the engines of the system.

Wm. Forsyth (RAILWAY AGE GAZETTE): The fifth section of the report says it has no effect on train resistance, but that is not necessarily a conclusion on the fact of the tractive effort of the locomotive. I have thought that perhaps in the experiments on the Pennsylvania Road where they oil the track on curves, that there may have been some measurements as to the effect of the lubrication of the rail on the tractive effort of the locomotive, *i. e.*, reducing the amount of adheasion.

F. W. Brazier (N. Y. C. & H. R.): I am very much surprised that there are not a good many more men advocating the use of flange lubrication on railroads. It does not make any difference in what direction you save money, and it seems to me that considerable money can be saved in the direction of lubricating flanges. I know that on the Pennsylvania division we run a great many trains on sharp curves. If some device of this kind will stop that wearing away, it will save money in other departments than the motive power department.

Mr. Haig: Replying to Mr. Forsyth; when properly applied, the lubricant is delivered to the flange of the wheel, and is conveyed to the side of the ball of the rail, and should not get on top of the rail. The matter of adjustment, however, has some effect on the hydrostatic lubricator. The oil is delivered through a nozzle and in other form of lubricators, there are various methods of delivering the lubricant to the flange. Now, if these various devices are not properly adjusted and properly maintained, there is a possibility of the lubricant being delivered to the tread of the wheel, and so to the rail. That was a point that we endeavored to bring out in the report, to call the attention of the railways to the necessity of proper adjustment, and by that I mean ordinary adjustment, which is reasonable to expect. Therefore, if the lubricant is properly delivered, it should not reduce the tractive effort of the locomotive. The effect of the lubricant on the flange will not reduce the adhesion.

D. F. CRAWFORD,
President, M. M. Association, and Vice-President, M. C. B. Association.

In reply to the question brought up by Mr. Smith, I note Mr. Smith states that while the question of an engine slipping on starting was mentioned to him down here, in his experience he had not been troubled in that direction. The same statement that I made with regard to the proper application of the lubricant, will apply in answering him also, and I think Mr. Gaines covered that point very well. In regard to the effect of trains descending grades, as touched on by one of the gentlemen present, there has been no difficulty that I know of with regard to the effect on the trains descending grades or the effect on the breaking power. On the road with which I am associated there has been no difficulty of that kind.

Mr. Gaines: For the benefit of Mr. Brazier I might say

that if he will look at last year's report he will find considerable data from the Southern Pacific on the saving of wear on tender wheels. Now, it is reasonable to assume that if you get a noticeable saving of wear on tender wheels that it will be carried back to the rear wheels of the train; of course, to a less extent. It is reasonable to suppose that there is a reasonable saving of wear on all the wheels of the train to a certain extent.

Mr. Flanagan (C. & O.): On one of the divisions of the Chesapeake & Ohio during the last 2 years we have experimented with practically every type of flange lubricator of the gravity feed class, and in some instances we have been using a rubber hose. In the last year we have tested one of the Chicago flange lubricators, using the special oil directed by them, and we have found that the engine on which we applied that lubricator had the tires in good shape after making 4,000 miles, and others after having made about 5,000 miles, and there is no question but that you would be able to run an engine over a greater distance than that. I think another feature that it would be well to consider, although we have not done any experimenting on it, and that is the question as to what effect it has on the tractive effort of a locomotive. One of the experiments that we have made, which is not a new one, is the use of nozzles from the air pump exhaust pipe. I have no data as to the exact amount of wear, but I am satisfied that we will get 3 times the mileage, from our experiment so far, by using that simple method than we do without it.

MINIMUM REQUIREMENTS FOR HEADLIGHTS.

D. F. Crawford: As chairman of the committee on minimum requirements for locomotive headlights, I would say that the committee had no further data of the scientific character presented in last year's report to present at this time. Some of the members of the committee have had experience during the time elapsing since the last convention, in appearing before some of the Legislative committees, and I think it would be very interesting for the association to hear from Mr. Rae, of the Louisville & Nashville.

DISCUSSION.

Clark H. Rae (L. & N.): In the past 6 months, high-power headlight bills were introduced in the States of Kentucky, Mississippi and Louisiana. In Mississippi, the railway did not present their side of the proposition before the railroad committee of the Lower House, and as a result the committee reported the high-power headlight bill favorably, and it was afterwards adopted. In Kentucky and Louisiana, the railways did present their side of the case, and the bills were rejected. Several members of the committee had participated in quite extensive tests of the headlights, and from my experience, verified by the reports furnished to the Interstate Commerce committee, which were afterwards reported in their bulletins of accidents, the high-power headlight is undesirable, especially on railways having multiple tracks and block signal systems or both. From my experience, I don't hesitate to say that at some of the meetings of the Legislatures of the various States, especially in the south and in the west, some of these high-power headlight bills will be introduced. Some of the bills require 300 watts at the arc, some 1,500 candlepower without the aid of reflector, and so on. I trust that this body will go on record that the high-power headlight is undesirable on railways having multiple tracks and block signal systems or both.

F. F. Gaines (C. of Ga.): I would like thoroughly to endorse what Mr. Rae has said. I think we should, as an association, go on record as being opposed to high-power headlight in connection with multiple tracks, and with interlocking or automatic signals, and I would like to make a motion to that effect.

The motion was seconded and carried.

STANDARDIZATION OF TINWARE.

The committee appointed to report on the standardization of tinware, and confer with a similar committee from the Railway Storekeepers' Association, has been unable to collect and compile the data in form to present at this convention. The Railway Storekeepers' committee held meetings in Chicago, December 19, 1911 and March 20, 1912, to which we were invited; unforeseen and unavoidable business engagements prevented Messrs. Poole and Franey attending. Mr. J. C. Mengel attended the meeting of March 20. Another meeting will be held May 19.

J. R. Mulroy, of the Storekeepers' Association, and his committee have prepared a very creditable report. Data which they have gathered from various roads show lack of uniformity in material used, method of construction and dimensions. Some of these affect first cost, others the life of the article. Cans nominally one, two or three gallons capacity have different dimensions and methods of construction on different roads. Some roads dispense with articles which are considered necessary on others.

From the data now collected and with further conference, the committee should be able to recommend standard articles to be used, also standard dimensions, methods of construction, and material which will represent good practice on our railways and standard practice of manufacturing. It is recommended that the subject be continued for another year.

The report is signed by:—M. D. Franey (L. S. & M. S.) and J. C. Mengel (Penna.).

This report was referred to the executive committee.

MAINTENANCE OF SUPERHEATER LOCOMOTIVES.

The committee on the maintenance of superheater locomotives was instructed to consider and report on: The best metal for cylinder and steam chest bushings; the best metal for valve and piston rings, and the best means of lubricating superheater locomotives.

In order to obtain as much data as possible upon which to base its report, the committee issued a circular of inquiry to the members which brought in the following information:

The total number of superheated locomotives in service is 2,222, of which 1,748 are of the fire-tube type and 74 of the smoke-box type. The following types of superheaters are used: Schmidt, Cole, Emerson, Vaughan-Horsey, Baldwin, Jacobs and Vauclain. Of these types, the first 4 are fire-tube superheaters and the other 3 smoke-box superheaters.

As might be expected, the steam pressures and degrees of superheat vary considerably on the various types of locomotives

R. D. SMITH,

Chairman, Committee on Maintenance of Superheater Locomotives.

on different roads, the maximum steam pressure being 220 lbs. per sq. in., and the minimum 150 lbs. per sq. in. The degrees of superheat, that is, the excess in temperature of superheated steam over the temperature of saturated steam at same pressure, varies from 100 degs. F. for fire-tube superheaters and from 10 degs. to 65 degs. F. for smoke-box superheaters. The temperature of superheated steam as used in locomotives rarely exceeds 600 degs. F.

Twelve roads reported that the cylinder and steam-chest bushings on superheater locomotives wear out more rapidly than on locomotives of the same classes using saturated steam, and 20 roads replied that there is no perceptible difference in the wear of cylinder and steam-chest bushings between locomotives using superheated steam, as now operated, and those using saturated steam. All roads reporting increased wear on superheated steam locomotives have superheaters of the fire-tube type.

Fourteen railways report that valve-packing rings of superheater locomotives wear out more rapidly than those of saturated steam locomotives of the same classes, and 17 roads state there is no appreciable difference between the wear of the rings.

Sixteen roads report they have found Hunt-Spiller gun iron

the best metal for cylinder and steam-chest bushings, and one other road intends to use this iron for cylinder and steam-chest bushings of new locomotives. Nine roads state they are using gray iron for bushings, 3 roads use the same metal for the bushings of superheater locomotives as is used for saturated-steam locomotives, and one road is undecided as to the best metal. All the roads favoring the use of Hunt-Spiller gun iron for bushings also favor its use for piston and valve packing rings, and two other roads report using this material for rings but do not use it for bushings.

Eighteen roads use piston-rod extensions and 12 use valve-stem extensions, but 3 of the 18 roads using piston-rod extensions are eliminating them. Eight roads favor the use of piston-rod extensions, 9 favor the use of valve-stem extensions, and 6 advocate the use of piston-rod extensions on locomotives having large and heavy pistons. Eleven roads are opposed to the use of either piston-rod or valve-stem extensions and two are undecided as to their desirability.

Twenty-three roads report there is no unusual difficulty in properly lubricating the cylinders and steam chests of superheater locomotives as they are now operating. Five roads report it is difficult and 3 state that trouble was experienced at first, but the use of a different grade of oil has overcome the trouble. One road using balance slide valve states, it is difficult to properly lubricate the valve, but no difficulty is encountered in lubricating the cylinders. Reports indicate it is no more difficult to lubricate locomotives with smokebox superheaters than to lubricate the ordinary saturated steam locomotive.

Twenty-nine roads are using hydrostatic feed lubricators with entirely satisfactory results. There is but one road using mechanical feed lubricator exclusively. Of the roads now using hydrostatic lubricators, 4 had formerly tried mechanical feed lubricators. The advantages of the hydrostatic lubricator are its reliability, simplicity of construction and ease of regulation as compared with the considerable number of moving parts of mechanical feed lubricators and the tendency of the latter to wear and get out of order.

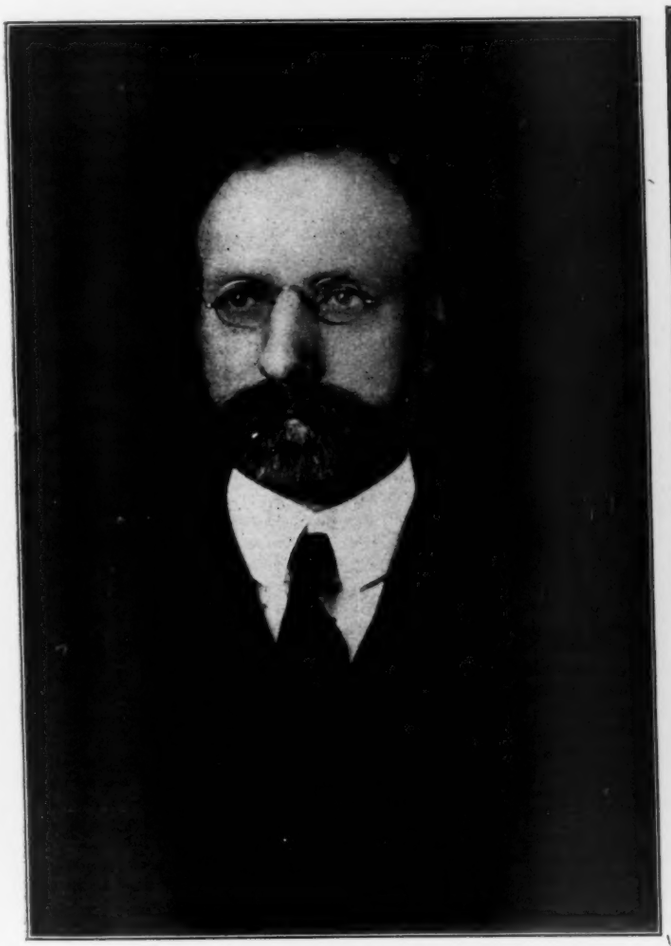
Atomizers are used on 3 roads to deliver oil to the steam chest of superheater locomotives and the results are reported to be satisfactory, but the committee is of the opinion that without atomizers, when the oil is discharged into the steam passageway above the entrance to the steam chest, it is partially atomized, which would seem to be desirable. The replies indicate that no advantage is derived from the use of an atomizer.

There are a number of different arrangements of oil pipes on superheater locomotives and these may be divided as follows: The most common arrangement is that in which the oil is delivered at the center of steam chest and at the center of the cylinder. Another arrangement is that in which the oil is discharged into the steam passageway above the entrance to the steam chest, with an independent connection to the center of the cylinder. Some roads use oil connections to both ends of the steam chest, with an independent connection to the center of the cylinder. A common arrangement, and one that is growing in favor, has a connection which discharges oil into the steam passageway only. It is claimed that the oil is thoroughly mingled with and distributed by the steam. A few roads report having oil connections to the center of the steam chests only.

Twenty roads consider it necessary to lubricate the cylinders of superheater locomotives independent of the steam chest, 8 roads that it is unnecessary and 2 are undecided.

From replies received and from the experience of members of the committee, there seems to be no doubt that an oil connection into steam passageway only, near entrance to steam chest, is the best arrangement for obtaining satisfactory lubrication. It reduces the number of feeds to a minimum and furnishes sufficient oil to valves and cylinders.

The allowance of valve oil per 100 miles for superheater locomotives varies according to type and service. The maximum allowance reported for Pacific type locomotives with fire-tube superheaters is 3.25 pints per 100 miles and the minimum 1.25 pints, the average allowance being 2.25 pints. For consolidation locomotives with fire-tube superheaters, the allowance of oil varies from 2.50 pints to 1.25 pints, the average being 1.75



T. RUMNEY,
First Vice-President, M. M. Association.

D. R. MacBAIN,
Second Vice-President, M. M. Association, and Vice-President, M. C. B. Association.

pints per 100 miles. The average allowance of oil for Mikado locomotives with fire-tube superheaters is 4 pints and the allowance for Mallets is about 6 pints per 100 miles.

The allowance of valve oil for superheated steam locomotives varies in about the same proportion as for saturated steam locomotives, according to type and service. It is customary to allow about 45 per cent. more oil for the fire-tube superheaters than for saturated steam locomotives, while locomotives with smoke-box superheaters usually have the same allowance of oil as saturated steam locomotives.

Twelve roads report using special superheater oil exclusively on superheater locomotives and 13 roads report using the ordinary grade of valve oil, but all the roads using superheater oil report it is more satisfactory, and tests which have been made of the 2 kinds of oil, on superheater locomotives, bear out this statement.

None of the roads report the admission of steam automatically to the cylinders when drifting, but 12 roads report good results from keeping the throttle slightly open when engine is drifting, and this practice seems to meet with most general approval. The use of vacuum valves on superheater locomotives is quite general on American railways, as 23 roads report their use gives satisfactory results and 5 roads report using by-pass valves.

There are a number of different makes of metallic piston-rod packing in use on superheater locomotives, all reported as giving satisfactory service. In general, the same types are used as on saturated steam locomotives, the principal difference, if any, being in the composition of the rings.

The chemical composition of the packing rings is in most cases unknown to the railways, the rings being purchased in finished state from the manufacturers. Where reports are given, a mixture of 80 per cent. lead and 20 per cent. antimony has been used with several makes of packing. Some roads have tried a mixture containing a small percentage of tin, but this has been found unsatisfactory. A widely different mixture containing approximately one-half copper and one-half lead has given exceedingly good results, but is expensive. In general, the preferable composition for packing rings is still largely a matter of experiment.

The committee received a great many suggestions and much information that is embodied in the report. The replies were so general as to indicate that this is a very live subject, and the committee feels that a report based on replies from such a large number of railways may be considered as representing conditions prevailing on practically all the railroads in the country.

SUMMARY.

An analysis of the replies indicates that the results obtained from superheater locomotives have been very satisfactory. It is interesting to note that 5 years ago there were less than a dozen superheater locomotives operating in the United States, whereas at the present time there are about 2,500 locomotives in the United States and Canada having fire-tube superheaters.

Minor difficulties have been experienced on a number of railways; but the great advantages to be derived from the use of superheated steam, such as increased economy of coal and water, increased power, due to the absence of cylinder condensation, the permissible reduction of steam pressure combined with the use of larger cylinders—all obtained without material increase in the size or weight of boiler—leads us to believe that the use of superheated steam in locomotives will increase rapidly.

This being so, it is of great importance to determine the metal best suited for use for bushings and packing rings on modern superheater locomotives because the use of highly superheated steam increases the difficulty of obtaining proper lubrication, and thus the metal is subjected to more severe working conditions than are usually found with saturated steam locomotives.

It is also important that we know the best means of securing proper lubrication because the efficiency of lubrication has a direct bearing on the life of bushings and packing rings.

A metal suitable for use as cylinder and steam-chest bushings of superheater locomotives should be homogeneous, close grained, tough and of good wearing quality, combined with sufficient strength. It should be tough in order to resist wear, but at the same time it must be of such composition that it can be readily machined.

Replies to the circular of inquiry indicate that Hunt-Spiller gun iron has been used on many railways with excellent results. This is stated to be an air-furnace charcoal iron, and the process of manufacture, combined with proper chemical composition, seems to result in a metal which is well adapted for use with highly superheated steam. The analysis of this iron, obtained by the committee, is as follows:

Silicon	1.40 per cent.
Phosphorus	0.35 per cent.
Sulphur	0.07 per cent.
Manganese	0.49 per cent.
Combined carbon	0.80 per cent.
Graphite carbon	2.20 per cent.

The importance of properly lubricating cylinders and steam chests of superheater locomotives, especially those using a high degree of superheat, can hardly be overestimated, because if proper lubrication is not obtained, many of the advantages derived from the use of superheated steam are offset by continual troubles from excessive cutting of bushings and packing rings, which keep the engine in the engine house when its proper place is on the road.

There seems to be a tendency to use too much oil in superheater locomotives, with the result that there is trouble from the oil carbonizing on the cylinder heads, pistons and steam passages. The deposit of carbon also tends to diminish the life of the metallic piston-rod packing, as it builds up in the stuffing boxes and under the vibrating cups to such an extent that the packing in a short time is forced to carry a part of the weight of the piston rod and piston head.

On certain classes of locomotives, possibly those having pistons exceeding 24-in. diameter, it is considered by some advisable to lubricate the cylinder independent of the steam chest, but in most cases we believe better results will be obtained by eliminating the connection to the cylinders and delivering the oil to the steam passageway.

The committee does not approve of the arrangement of oil pipes in which the oil is delivered near the end of the steam chest, as in this case it is probable that part of the oil is lost in the exhaust, due to the difference in pressure between the live and exhaust steam.

A number of roads report that when superheater locomotives were received from the builders oil was delivered to both ends of the steam chest and to the center of the top of the cylinder; but this arrangement has since been changed so that the oil is now delivered into the steam passageway above the entrance to the steam chest, and the feed to the cylinder has been discontinued. The allowance of oil has also been reduced and it has been found that the locomotives are much better lubricated than formerly and there is a marked diminution in the quantity of oil adhering to the cylinder heads, piston heads and steam passages.

There can be no doubt of the advisibility of using a good grade of mineral oil having a high flash point, for locomotives using highly superheated steam, because the temperature of the superheated steam is sometimes as high as 600 degs. F. A number of the roads state they have used valve oil having a flash point of about 520 degs. and also special superheater oil having a flash point of at least 585 degs., and in every case better results have been obtained from the oil having the higher flash point.

Tests have shown that a moderately high temperature has very little effect on the lubricating properties of a good grade of valve oil when the oil is protected by steam, but when the engine is drifting there is, in most cases, no steam in the cylinders, and the bushings are apt to become hot.

There does, however, appear to be a difference in the results obtained on superheater and saturated-steam locomotives. When drifting the conditions are the same on both, but on saturated-steam locomotives the oil deposit on the cylinders is fluid and the condition of the oil does not appear to have changed; while on superheater locomotives the deposit is gummy and sticky to the touch. This difference may possibly account to a large degree for the rapid wear of piston rings and bushings occasionally experienced on superheater locomotives.

When an engine is drifting a good deal with a closed throttle, there is a considerable vacuum in the cylinders and steam chests, and cinders may be drawn through the exhaust and dirt through the relief valves.

This dirt may adhere to the gummy oil on the cylinder walls and convert them into a lap which will wear away the packing rings and piston heads very rapidly.

This theory explains the good results obtained on locomotives where the drifting throttle has been carefully used and is supported by analyses of the deposit found on the cylinders, which show the presence of cinders and dirt in considerable quantities.

The remedy is obviously to obtain a quality of oil that does not make a deposit of this nature at the temperature to which it is exposed, and to provide means either by ample vacuum or by-pass valves, or by the admission of steam to prevent overheating when drifting.

Many roads use a tandem type of metallic packing on account of the importance of preventing the blowing out of the lubricating oil, which might result in the cutting of the cylinder bushings.

During the past year or two, several alloys have been tried that have given satisfactory results, and while the preferable mixture will vary with the type of packing employed, this question is not now a serious one.

It is important to use a type of piston-rod packing which will stand up under the high temperature met with in the use of superheated steam, and considerable trouble has been experienced

with packing that had proven satisfactory with saturated steam when this point had not been attended to. The melting point of the packing rings should be higher than the melting point of rings usually found on saturated-steam locomotives.

In conclusion, the committee feels that, in order to insure satisfactory results in the operation of superheater locomotives, it is of the utmost importance not only to use the best metals for parts subjected to the action of superheated steam, but it is also important to take all reasonable precautions to obtain proper lubrication.

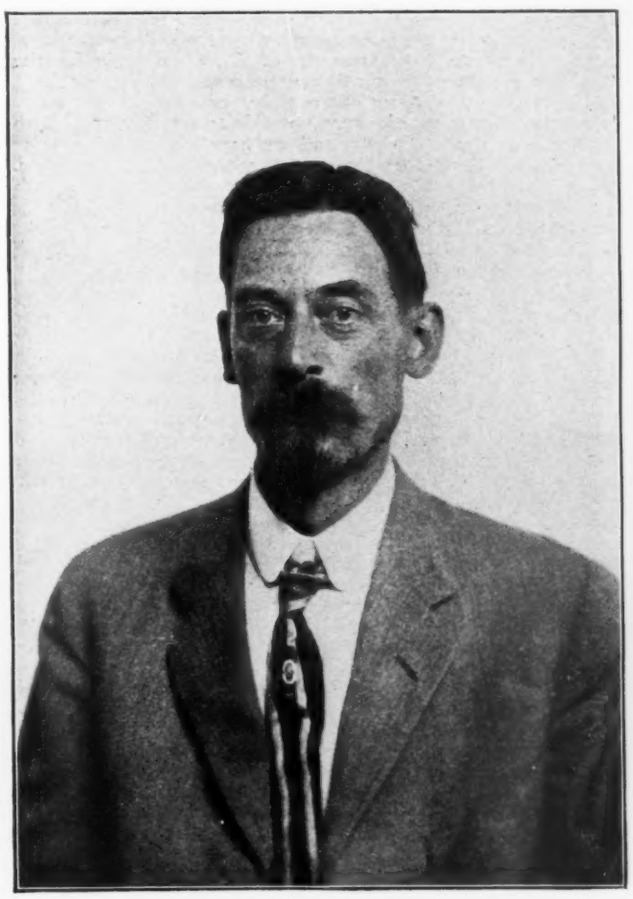
When superheater locomotives were first placed in operation it was to be expected that certain difficulties would be experienced, but these difficulties have been overcome one by one and we believe that at the present time, with reasonable care in operation and with proper attention on the part of engine-house forces, superheater locomotives will be no more difficult to maintain than saturated-steam locomotives of the classes.

The report is signed by:—R. D. Smith, (B. & A.), chairman; W. H. Bradley, (C. & N. W.); H. H. Vaughan, (C. P.); Joseph Chidley, (L. S. & M. S.), and J. B. Kilpatrick, (C. R. I. & P.).

there were less than 50 superheater locomotives on locomotives, and today, after a period of only 3 years, there are nearly 3,000 and on my way to the convention, I learned from a representative of the superheater company, that they now have under construction something like 1,000 additional superheater engines.

The committee makes some recommendations about what is claimed to be the air-furnace charcoal iron best suited for superheater locomotives, and we give the analysis as furnished us for this iron, which is very similar to that which has been adopted as standard metal for locomotive cylinder castings, cylinder bushings, cylinder heads, steam chests, valve bushings and packing rings in 1906 by this association.

There is a point about the more rapid wear of packing rings that the committee thought had perhaps been overlooked, and that is that the general practice in parting a cylinder ring, is to leave about 1-32-inch opening in the rings. That will do for saturated steam locomotives, but it is found that it is not sufficient for a locomotive cylinder using superheated steam. We need there at least ⅛ inch for about a 20-inch cylinder. I think that is a point that has been overlooked a little, and it



F. F. GAINES,
Third Vice-President, M. M. Association.

ANGUS SINCLAIR,
Treasurer, M. M. Association.

R. D. Smith, chairman, presented the report in full and after its presentation said:

Since the introduction of superheated steam on locomotives by the Prussian State Railways in 1898, the whole railway world has been much interested in the development of the superheater on locomotives. In the last few years several committees have been appointed by this association to study from different points of view the results obtained from the use of superheated steam on locomotives. If I remember correctly, one of the reports, that which was presented in 1909 which was a very brief one, was in effect that the history of superheating had been gone into very thoroughly, but that the outlook for the future adoption of superheating on American roads looked good, and the committee expressed the belief that there would be a considerable amount of development work along the line of installing superheaters on locomotives. The members of that committee must have been born of prophets, and how well they prophesied is borne out by the fact that at the time they made their report, may pay some of the members having too rapid wear of cylinder valve rings, to look into it. The committee has been given to understand that the mechanical feed lubricator has been used quite successfully, more so than the information they got led them to believe, and that there are several members here who have had some experience along that line, and would be glad to give these experiences.

The Vice-President: We will consider that the report of the Committee on Maintenance of Superheater Locomotive is received and open for discussion.

DISCUSSION.

C. A. Seley (C. R. I. & P.): I think that the report is an exceptionally good one, and gives information very fully on the very many points which have been covered by the report, although there is one point on which I regret that the committee has not expressed itself in the summary of the report, and that relates to questions referring to the use of piston-rod or valve-stem extensions on superheater locomotives. There is

no doubt of the expense of the application and maintenance of extensions, particularly on piston rods. The location of the device, is one which, in many types of locomotives, materially affects the integrity of the buffer beam, which has to be cut for the rod to pass through it.

On some of our engines which we received with extensions, we have cut off the extensions as a matter of experiment, and while I have not complete information, my impression is that the files show that so far as cylinder wear and other elements of wear are concerned, that there has been no material increase. I would rather favor the valve-stem extension as it is easier to accomplish, very much cheaper to maintain, and it is perhaps more important to effect fine distribution through a longer period of time of maintaining the valve central and without wear, or at least to reduce the wear, but in my own mind I have always seriously questioned the value of the piston rod extension. I know that the opinion is that a very fair majority of the roads or at least a fair number of the roads are opposed to the use of the extensions, as against the number which are using them, or favor the use of the entensions.

C. E. Chambers (C. of N. J.): I note the committee, in framing up the report, made no mention whether snap rings or Dunbar patent type rings were used, and to what extent. It occurred to me there should be less wear with the Dunbar type of ring, and it would also apply to the extra amount of allowance, that would be given to a snap ring, as Mr. Smith stated, ⅛ in., not less than that. The Dunbar type of packing would allow for more expansion without cutting the cylinder.

F. F. Gaines (C. of Ga.): Recently we had a very interesting exhibit and a paper at one of our Railroad Club meetings on the use of oil in connection with superheated engines. The apparatus was very complete, and was so arranged that we were able to see just exactly what happened, how the oil acted with and without steam under these high temperatures, and it emphasized one of the points brought out by the committee as to the value of cracking, the throttle slightly while drifting, so as to always have steam in the cylinder. It was thoroughly demonstrated that as long as there was any steam in the cylinder the oil would not carbonize, but, on the other hand, it would carbonize under these extremely high temperatures if the steam was not present. That not only accomplishes the non-carbonization of the oil, but prevents the cylinder from heating.

While we have not had our superheater engines in service long enough to determine what amount of wear we are going to get with the Hunt-Spiller gun iron, I do feel that we are going to get very favorable results because of several years' experience with the material in our saturated steam engines. Recently, while visiting our chief shop, and in talking with a master mechanic, I asked how he was getting along with his packing rings and pistons, and whether he was still as favorably inclined to the use of that material as his previous reports had shown, and he said: "The best answer to that question is that we have almost forgotten we have a cylinder-boring machine in the shop; formerly every engine coming in for general repairs needed a little truing up, and we have almost done away with the use of the cylinder boring machine."

There was another thing in connection with the lubricating of these engines. At this same Railroad Club meeting, the point was brought out quite effectively, I think, that it is desirable, not only to apply your oil in the steam pipe, but in so doing, to extend the nozzle at least nearly to the center of the pipe, in order to atomize as much as possible of the oil at the moment of delivery. I notice the chairman of the committee referred to the application of the oil where only lubricator pipe has been used, that is, the introduction of all the oil in the steam passage, and I very much wish if any of the members present have been using this device successfully, they would let us hear from them.

C. E. Chambers (C. of N. J.): We have only one superheater engine in service, and that is an Atlantic type, running between Jersey City and Philadelphia. You all know the high speed that the engines make on that division. The oil is piped directly in the passageway, about half way I should say, from the steam chest to the smoke arch, and we simply use a long stem, extending about half way into the middle of the passageway. We had some trouble at the time that we started this lubricator, but it did not amount to very much; the cylinders looked quite dark, not showing any sign of cutting, and did not get the bright effect you ought to have when using saturated steam engines. We have largely overcome that difficulty by simply giving the new metal time to polish up, and so far no bad results are experienced from the one pipe.

It was suggested to us that we should put an additional pipe in the cylinder, but personally I was opposed to it, and I took the trouble to inquire of different roads that had both methods in use, as to the results of their experience, and I convinced myself that I was right in thinking that the steam will be better lubricated by the one pipe going into the passage way.

J. R. Onderdonk (B. & O.): With regard to the lubrication of superheater and the remarks that have just been made, it appears from the tests that we have made so far, that by lubricating the steam, as it were, we get very much better lubrication, both in the steam chest and in the cylinder, than if we attempt to introduce the oil into the steam chest and into the cylinder by several different pipes. By the introduction of the oil into the steam chest, if there is any blow at all, it simply blows the oil out into the exhaust passage, while by introducing it into the steam passage, especially with a bent metal pipe turned in the direction of the passage of the steam, it seems to atomize the oil, lubricating the steam, so that all parts of the cylinder and all parts of the steam chest are lubricated.

Thos. Roope (C. B. & Q.): Yesterday I was very much interested in the remarks made by Dean Benjamin, on the report of the committee, wherein he states that he anticipates a saving of 20 per cent. in fuel. This figure to me seems remarkable, and should greatly assist in the advancement of the superheater locomotives. I agree with the remarks of Dean Benjamin for the reason that on some of our heavy passenger power we have been able to run by coaling stations that before, with the saturated steam locomotive, we were not able to do. That has also been true with water stations, and we have also had the same experience with heavy freight power, which means less labor. We now have about 200 of our largest locomotives equipped with the superheater, and we are adding to that number as rapidly as we can do so. I hope that the time will come when by the use of the superheated locomotive, or some similar device, we will be able to run by or discontinue every other coaling station.

W. C. Hayes (Erie): While the paper itself treats more particularly of the construction of the superheater locomotive and the detail defects that may occur in the locomotive, there is nothing to the report that pertains to the operation of the superheater locomotive, and that is a viewpoint from which I would like to hear the superheater locomotive discussed. There is no doubt that this is one of the questions that is more alive today in locomotive practice than any other one pertaining to large locomotives, and it is being considered mainly from the point of view of the saving that can be made, particularly with regard to the use of fuel, as well as, perhaps, increasing the efficiency of the locomotive to its highest degree. We have, as I said before, no data that will sustain the position that I have had in mind from what little experience we have had with the superheater locomotive, and in seeing these engines in service. The Erie Railroad, with which I am at present connected, has 35 Mikado engines equipped with the Schmidt type of superheater now in service, on one of its heavy operating divisions; it is a heavy, hilly and choppy railroad, and recently the speaker was at a point where he could see the greatest number of these engines in service, so as to see whether or not they were loaded to their maximum capacity. In 4 or 5 days we had half a dozen engines which gave up their trains on account of serious defects that developed in locomotives, so that they were unable to continue further with the load, and had to run in light.

Now, there are certain claims being made as to the savings that accrue from the use of superheater locomotives. Figuring on that from a purely fuel standpoint, and admitting the allowance that the superheater people claim for locomotives equipped with a superheater, say a 20 or 25 per cent. saving, if we figure the value of a locomotive at about what operating people generally do, it occurred to the speaker that the saving in all directions and increased efficiency of the locomotive also, added to that of the fuel which might be saved, would be more than absorbed in the cost of the maintenance of the superheater.

Now, if that is true, that is a serious phase of the superheater problem. If that is not true, and the defects that have been thus far developed can be remedied so that they will not recur, and you can keep your superheater locomotives in operation continuously and constantly, then no doubt it is one of the greatest savers, both in fuel and efficiency of the locomotive, that has struck the American railroads to-day, and it is a result well worthy of all of the best efforts that can be put forth in its advancement.

Mr. Seley: I would like to answer the last speaker in some measure, at least, perhaps, from our own experience. The records of this association will show that the Rock Island road had the greates number of superheating engines of any road in the country for several years. True, it was a small number of engines when compared with the superheater engines in use across the border, but so far as the States are concerned, we had superheater engines in advance of the other railroads in the

States for two or three years, and soon after obtaining them I was very frequently asked how much superheat we obtained. I said, "I do not know," and I did not care very much, the principal point was to overcome the very difficulty which Mr. Hayes speaks of and to have a practical road proposition. I will admit freely, that we did have quite a little trouble with the superheater at the start. It was of a type which has been found not to be of the best in its detail arrangement, and important changes had to be made, as well as attention given to a number of relatively less important matters of detail in the construction, so that it took 2 or 3 years to work these engines up to a practical road proposition, to a point where we did not know that the superheater was on the locomotive.

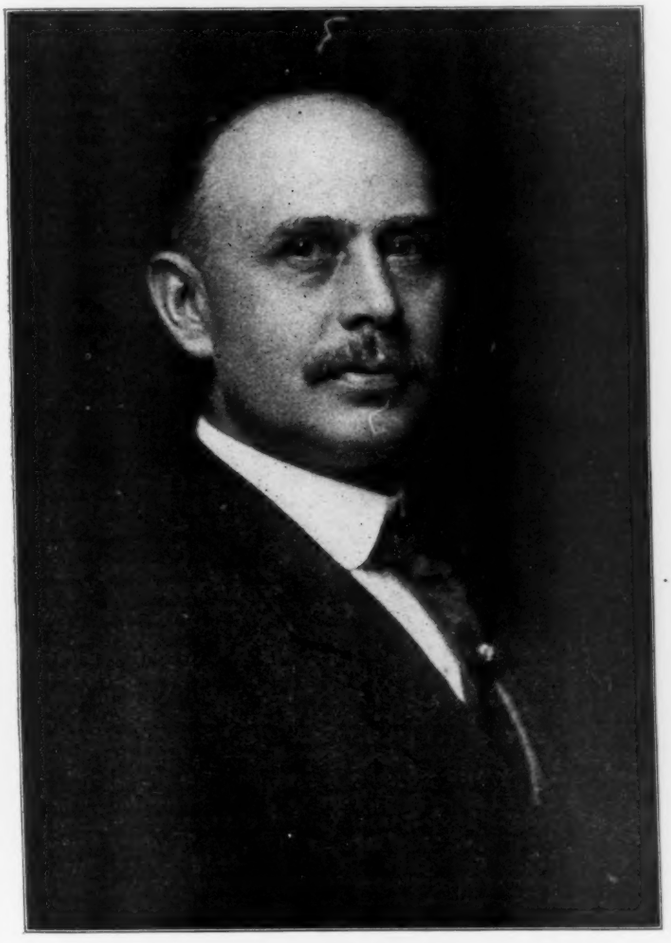
I feel convinced, from the large proportion of superheaters which we now find being constructed in the shops of the locomotive companies, that the roads generally have overcome, to a great extent, the early troubles. In our own case we have gone on, and with an improved form of superheater in our later engines, we are securing very admirable service. So far as the question of economy is concerned, as compared with the saturated steam engine, I am not able to say from our own records. We have about 60 superheater engines, but they are all passenger engines except one, and that has a front end superheater which is not comparable in performance with the others. I will say this much, however, as testimony in regard to a comparison which was given to me by our friend, Mr. Quayle, who is not present, although admirably represented; in conversation he stated to me that they were giving their superheater consolidation engines a 10 per cent. greater tonnage rating than the equivalent size non-superheater engines, or saturated steam engines, and with that 10 per cent. greater tonnage rating, they were also getting a 25 per cent. coal economy. I presume that those are regular road figures, and are not a test performance, as I do not think Mr. Quayle would make that statement unless he was very fully assured of its being a regular performance.

J. A. Pilcher (N. & W.): I wish to ask Mr. Hayes if he will state the nature of the trouble he experienced. We have had a number of superheaters recently installed, and the general performance has been very satisfactory. We have no exact data yet. I would like to know just what the trouble is with these superheaters and the type of superheater.

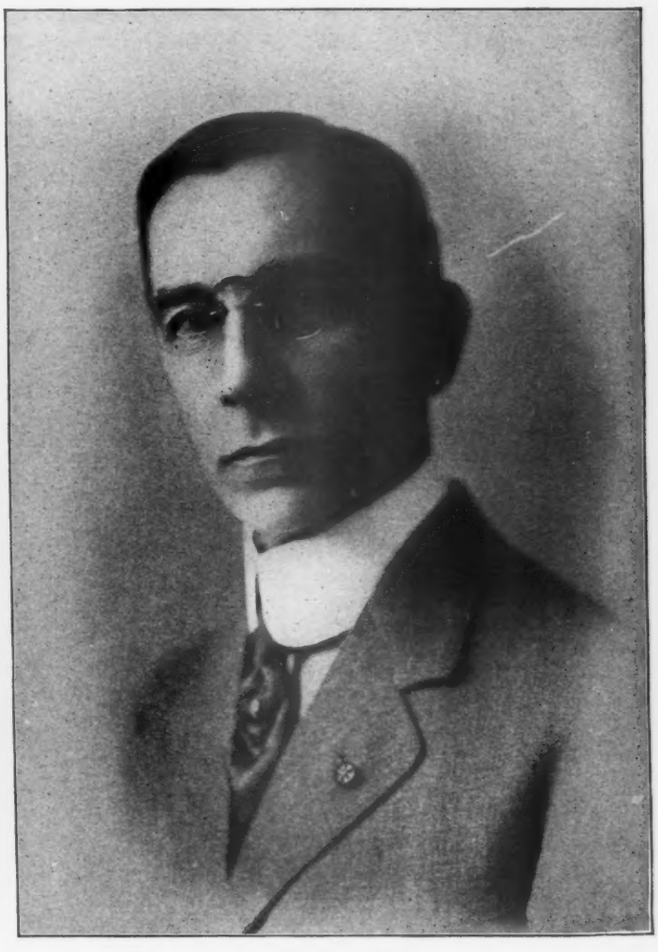
W. C. Hayes (Erie): In answer to the gentleman's question, I would say that the troubles occurring on the engines to which he has just made reference, covered a variety of things, leakages in the superheat tubes, in the headers and things of that character, so that the engine would not steam, and had to give up its train on the road, which to my mind would make the superheater a very expensive engine to operate when all things were considered. The Schmidt type of superheater is used on several passenger engines of the Pacific type, the largest type of engine we have in service, and which individually give a very good account of themselves, making a magnificent saving. But when you take the whole general proposition into account so far, after an experience of 6 months with 35 engines, we have not been able to see any saving, as compared with the consolidation, which is prior to the introduction of the Mikado.

S. L. Bean (A. T. & S. F.): I would like to inquire if the members have experienced troubles from the smoke tube breaking at the contracted end or the fire-box end of the tube; also the valve-stems and piston-rod packing blowing out on the road.

W. S. Morris (C. & O.): We have running daily 25 machines on the division which come directly under Mr. Murray's charge. Last year we took some special interest in the saving of fuel on this particular division, and the comparison so far as fuel is concerned, showed a saving of from 18 to 26 per cent. as compared with the engines that we used the previous year which were saturated steam engines. These 25 engines have the following general dimensions: The total weight is 400,000 lbs., weight on drivers, 337,000 lbs.; the maximum tractive effort, 78,200 lbs. They have developed a fuel economy as high as 43 per cent. per fuel ton mile, and I am very much pleased and encouraged with the remarks of Mr. Murray, which indicate that the reports appeal to him, and I am quite sure with the strenuous economical conditions that we have had to contend with on



C. E. FULLER,
President, M. C. B. Association.



M. K. BARNUM,
Vice-President, M. C. B. Association.

our road for some little time, the maintenance of these 25 Mallets was particularly good. Therefore, I am inclined to believe that Mr. Haye's troubles would possibly be little as compared with the great subject of superheat.

Mr. Pilcher: In making these comparisons, did you compare a compound superheater Mallet with a consolidation type?

Mr. Murray: Yes, those were comparisons.

J. A. Pilcher: I would like to ask Mr. Hayes what type of joint, whether a flat joint or a ball joint, and did they give trouble?

Mr. Murray: I want to say for the information of Mr. Pilcher that we practically have the same trouble with leaky joints, and we reduced that entirely.

C. D. Young (Penna.): The Pennsylvania Railroad have not had very long experience with a high degree of superheat on locomotives. Some few years ago they tried a low temperature superheater, but it did not prove very satisfactory, and it was not until about a year ago that investigation was made into the application of superheated steam to our equipment. I believe today we have something over 200 engines either on order or in service, and our experience has not been long, although it has been rather curious in the last 5 or 6 months. We have not had, considering the rapidity with which the engines have gone into service, a great deal of trouble; our troubles were largely confined, not to the superheater, but to the things incident to the application of the superheater, *i.e.*, the proper lubrication, and the proper material for bushings, and packing rings. A careful investigation of the conditions bringing about train detentions or troubles on the road, due to lubrication and packing rings, developed early the fact that it was largely in the handling of the engines, more than in the actual material that was being used, and I feel that the committee have fully covered this situation in their investigation where they say that some steam must at all times be passed through the cylinders in order to obtain good and sufficient lubrication. We at the present time are making a rather careful investigation of the details as to materials and methods of operating the superheater locomotives, and it may be of interest to the committee to know just what we have been doing. I may say first that we have found that it is hardly necessary to lubricate within the cylinder. Our practice at the present time is to put what we call an atomizer on, which is simply a 3/64 in. hole, shaped the same as a nozzle of a viscosimeter, back about 22 in. from the piston valve in the smooth passageway. This seems to give us the best results of any method of lubrication so far as applying the lubricant is concerned. The cylinder lubricant has been omitted, and we have found that the lubrication seems to be better, if anything, with simply one oiler admitting the oil well back of the valve. We have had some experience with hydrostatic lubricators which has not been entirely satisfactory, largely due to conditions of chokage, I believe, and the condition of the oil pipes. I believe I am safe in saying, from our length of experience, that the superheater locomotive is exceedingly sensitive to anything that is slightly wrong. That same condition might exist on a saturated engine, and the engine will go along and do its work daily without giving any trouble. But if that same condition exists in a superheater engine, you can look for trouble pretty quickly. We found trouble from choking in the hydrostatic lubricator at two different points. For instance, at the lubricator, and in the steam passageway down to the valve. If the oil pipes have some slight obstruction in them, trouble will be experienced, and it seems to me desirable and almost necessary to have constant lubrication at all times when running. We recently made some experiments at the locomotive test plant to determine what the temperatures in the valve and valve bushings and cylinders amounted to, to see where most of the trouble originated. The results of these experiments have not been entirely worked out, but the indications are that the average temperature of the valve bushing is only about 93 per cent. of that of the steam in the steam passageway; whereas, the average temperature of the middle walls of the cylinder is as low as 55 to 60 per cent. of the temperature of the steam, showing a very considerable difference between the temperature of the metal in the valve bushing, as compared with the piston and the cylinders. That would seem to indicate to me that careful consideration should be given to design and materials in the valve, in the bushings. The committee has touched upon the necessity of tail rods, and I am inclined to feel the same way that Mr. Seley does, that an extension rod on the piston is not necessary, however, if we are to have 300 lb. valves, it would be necessary to obtain good service.

There has been nothing mentioned whatever about the relative merits of locomotives, equipped with superheaters having dampers, and those not having dampers. The practice seems to vary in that respect, and I would like to ask some of the members if they would give me an expression of opinion as to the necessity or value of the use of a damper or its elimination. I would make a motion that the committee be continued and asked to report next year on the construction and operation of the superheater. I think it is about the liveliest subject we have at the present time.

Mr. Pratt: We had 2 superheater engines that were very much coddled and babied for about 2 years. One was an Atlantic type engine, and the other was one of our largest freight engines. After a while we gradually lost sight of them. However, since that time we have progressed quite rapidly along that line and have nearly 200 superheater locomotives of the consolidation and heavy Pacific types. As fast as the saturated steam engines of the same class pass through the shops for heavy fire-box work, they are changed to superheaters. We use the Schmidt fire-tube heater altogether. We have no trouble with the back end of the small superheater pipes, as some one asked, and lately we have had very little trouble with the joints leaking. That is perhaps our worst difficulty on the start. I don't think our men knew how to make a proper joint, and I am quite sure the builders did not know. We have found some cases of poor results with superheaters, especially in passenger service, that upon investigation proved entirely due to not keeping the large tubes cleaned out, and from our experience I would urge that with this type of superheater careful inspection be made by responsible men.

We have not thought it was necessary to use the extended rod, although we have a limited number and are trying them out to learn which we will finally adopt. We have had but a few cases of the rod-packing melting, and I don't remember but one or two cases in the last year where an engine had had to give up a train for that reason. The use of cylinder feeds is still a question with us. We would rather spill oil unnecessarily than have trouble with rod, and we do use the cylinder feeds quite largely. Some of the master mechanics have cut them out, and are having good results; and, personally, I don't believe that they are necessary, but they may be an added precaution. We have the feeds run into the steam chest at various points, with all the piston valves. Some of the feeds are split and the oil is fed over the traveling rings, which apparently is a little better than fitting it over the center of the spool. I would like to emphasize what one gentleman has said with regard to the avoidance of drifting with a superheater locomotive. I believe it is advisable to avoid drifting on a saturated engine. With the skill and practice of the men in avoiding drifting, we find that we can take the release valves off. We have done so on a large number of engines, and there is no doubt in my mind that if you can depend upon the engine men, that the relief valve is unnecessary; also the air drawn through the relief valve is very likely to carbonize the oil. It is only natural that with the high degree of temperature, great dependence must be placed upon regular lubrication, and we have come to believe that that is perhaps the secret of successful operation more than the amount of lubrication. With a saturated engine, we all know that frequently they fill the lubricator on the road, after which it takes from 15 to 20 minutes to get the oil to the parts to be lubricated. With a superheater engine, that won't do. We have got to have regular feed. On the night runs we have found it most advisable to give the engine crew a light back of the lubricator feed, so that they may know what they are doing at all times. It is with a good deal of satisfaction to me that the reports of careful tests indicated that a lower steam pressure may be used on superheater engines than we have been using on the saturated engines, and I rather regret to see these superheater steam pressures going up to 200 and 220 lbs. We know the lower steam pressure reduces our boiler troubles very greatly, and still it may be necessary to get such a large pressure in order to give power to some particular locomotive. I don't believe that this is necessary on all roads or on all classes of service, and I have a feeling that we should keep our pressures down as much as possible. One gentleman has just suggested that I say a word with regard to some tests that were conducted on our runs between Chicago and St. Paul with superheater engines, because that emphasizes decidedly the fact that the superheater engine is most efficient when worked to its maximum capacity.

The trains upon which these engines were tested were much heavier northbound than southbound, and if I remember rightly the northbound economy would pay for the extra cost of the superheater in between 2 and 3 months, whereas the southbound economy was less than one-half of that obtained on the northbound trips. The use of dampers is something we have never abolished, except when they froze up last winter. Damper cylinders froze up somewhere about every 24 hours on the road and we changed the cylinders from horizontal to vertical, so that this would be avoided. We didn't get it patented so that you can all use it. I understand there are several roads representel here that have used an improved form of plug valve for superheater engines, and it would be interesting to me and perhaps

others if they would advise us if they are giving entire satisfaction.

M. K. Barnum (Ill. Cent.): We have about 125 superheater engines in service, and they have been remarkably free from troubles. They have been now in service about a year, and much to my surprise, everyone that has had anything to do with them has been enthusiastic over their performance, and several of our master mechanics who have had them under their supervision expressed the opinion that they would cost less for maintenance than the saturated steam engines of anything near the same power. These locomotives have rather more power than any of the simple engines on our road. We have had no trouble whatever from piston rod packing. We are using a type of piston packing which has the perforated holes in a curve in the face of the ring, and they are having comparatively no trouble with it cutting the cylinder.

This packing was developed on our road with the sinple engines before we got the Mikado, and w s tested first in one of our enginehouses where we had a conso idation engine that was very severe on the cylinder packing, so much so that the packing had to be renewed every week. I omitted to say that this was a snap-ring packing. In the case of this experimental engine, the packing ring was applied, and where the engine had been requiring new packing for about every 700 or 800 miles, it ran 55,000 miles, and was replaced when the engine went into the shop. We have been using the dampers in our engines and believe them to be essential to the proper operation of the superheater. We have had a little trouble with the superheater headers breaking, which seems to be due to shrinkage cracks, and that has occurred in only, I think, 3 cases out of 125 engines. That, we believe, will be overcome by modifying the design. We use a ball joint between the superheater elements or units, and the header, and have had very little trouble. In one or two cases the bends have broken, which was apparently due to the bends having been drawn up too tight, or not properly adjusted when the engine was built. This has been limited to so few cases that it appears to have been simply inaccurate workmanship and not a fundamental fault. We will probably have about 200 superheater engines in service by the last of this year, and we have no doubt whatever as to their success. We are getting about 20 per cent. fuel economy, and about 25 to 30 per cent. present economy of water, and we are able to run water tanks regularly, where formerly the locomotive had to stop.

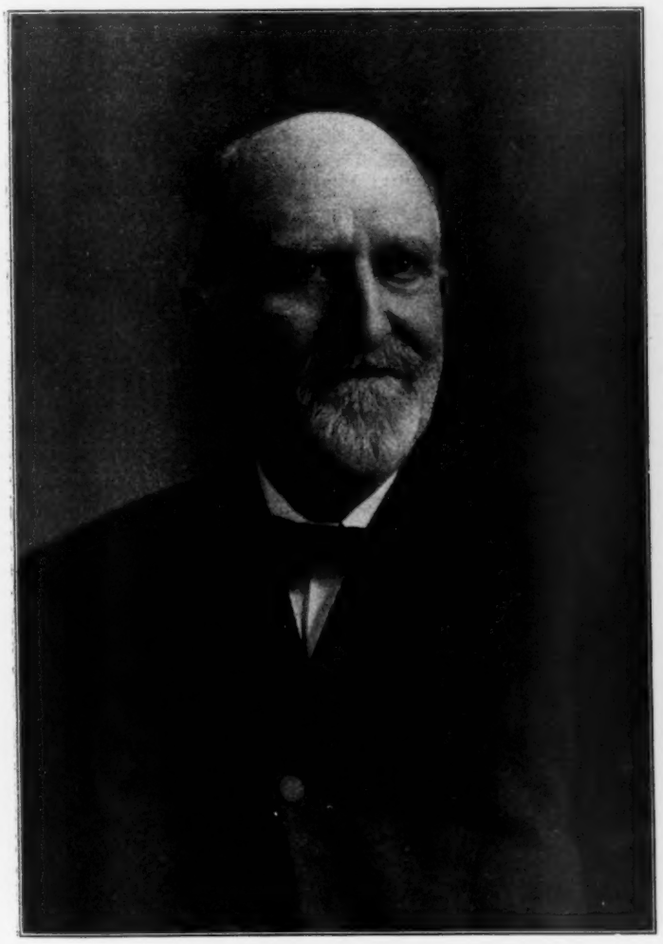
M. Flanagan (C. & O.): The gentleman who has just spoken made mention in regard to the packing. If there is no objection, I am satisfied it would be of benefit to all the members of the association if a sketch could be made of that packing and it can be shown in the proceedings. I hope some arrangement can be made by which it can be done.

M. K. Barnum: I would be very glad to show the packing. It is very nearly identical in design that the Northwestern are using, and it has been very satisfactory. I have had experience with it for something over 12 years.

J. F. DeVoy (C. M. & St. P.): Mr. Pratt of the Northwestern said, which was true, that the highest economy is obtained from the superheater while it was working at its fullest capacity. The only condition I have to add is that where the water is bad the superheater engine acts much better than the saturated engine for the water carried through the throttle is evaporated while going through the superheater tube. I am led to believe that possibly 15 to 40 per cent. can be obtained in ordinary service with ordinary water, and I am ready to believe that in a bad water district, that perhaps as high as 30 per cent. over the present practice can be obtained in a non-superheater engine.

Jas. Chidley (L. S. & M. S.): I want to say for the Lake Shore, that we have removed the dampers and the plates back of the diaphragm. Of course, our road is a low-grade road, and not as much driven on as the Pennsylvania or some higher grade road.

D. J. Redding (P. & L. E.): One gentleman referred to the fact that it seemed necessary to maintain constant lubrication in order to have successful operation. That does not seem to have been threshed out. I think it might be possible to hear from some of the other roads to see if they



J. S. LENTZ,
Treasurer, M. C. B. Association.

J. W. TAYLOR,
Secretary, M. M. Association and M. C. B. Association.

got any better results from the hydrostatic lubricators. We have two superheater steam engines, and all I hear is that the injectors cannot be cut down often enough and the firemen don't get enough exercise shoveling coal.

T. R. Cook (Penna. Lines): Our experience is very meager, and what I say must be taken with a grain of salt. We have engines on our lines that are equipped with superheaters, but I have no information as to the comparative results obtained with the tube type of lubrication. We have had, though, some experience with the 4-speed lubricator, which seems to indicate the necessity of constant and sure lubrication. It was found that the pressure in the choke blocks when the engine stopped dropped very rapidly, dropped down in a short time to 20 or 30 lbs., and it took a number of minutes to get that pressure up again so that oil would be delivered to the parts to be lubricated, and by changing the choke blocks and experimenting with them we have been able to get a choke block that will hold the pressure, so that in the ordinary stops there is no lack of lubrication. As soon as the engine starts the oil begins to feed to the steam chest. As to the location of the pipes, the original installation had a tallow pipe in the cylinder and one in the steam chest, and our experience seems to indicate that we did not get any benefit from the lubrication of the cylinder, and the best location of a single pipe is in the steam passageway—not as to a question of atomizing the oil, but as to putting the oil where it will go to the parts to be lubricated.

R. D. Smith (B. & A.): The matter of extension pistons and valve-rods was discussed in the committee before the circulars were brought out, and while it was not anything the committee were directed to look into, they did think that it was closely allied, and they therefore asked the question, and found that they were not looked on with great favor. We didn't get reports but from very few that were using Dunbar packing. I don't think anybody reported using it exclusively on any type of engine. The spring ring form seems to be that most generally used. The suggestion of using lower pressures seems to me to be a most excellent one, and one that I think we would all aim to follow, providing always that the clearances were sufficient on some of the roads. That is quite an important feature. We are surprised at the experience of Mr. Hayes. Mr. Hayes was evidently looking for trouble and found it—or rather, he was looking for trouble, but perhaps the suggestion might not be amiss to him that he was looking in the wrong place for it. If he had gone to the engine house instead of to the superheater engine, his troubles might have disappeared. Like all devices when new, the superheater engine gave us some troubles. We rather expected them. We started in with a superheater engine looking for trouble, and we have been looking for trouble ever since, and we haven't found it; and the answers that this committee received to some of the questions were very full, and we feel warranted in saying what we have said in the report, that a superheater engine will cost no more to maintain than a saturated steam engine of the same type.

ENGINE FENDER WHEELS.

Action was deferred on the this report until definite action was taken by the M. C. B. Association on car wheels.

The Vice-President: Mr. Seley's motion is that this association do not provide for recommended practice, but simply as a standard. Therefore, in view of that, I would suggest that Mr. Seley move an amendment to Mr. Gaines' motion. Will Mr. Gaines second it?

Mr. Gaines: I second the motion.

The motion was carried.

CONCLUDING EXERCISES.

The usual resolutions thanking the technical press, particularly the RAILWAY AGE GAZETTE, were adopted.

The following officers were elected: President, D. F. Crawford, (Penna.); first vice-president, T. Rumney, (C. R. I. & P.); second vice-president, D. R. MacBain, (L. S. & M. S.); third vice-president, F. F. Gaines, (C. of G.). Executive members, terms expiring 1914, G. W. Wildin (N. Y., N. H. & H.), C. F. Giles (L. & N.), and William Schlafge (Erie).

Scott H. Blewett was delegated to hand the ex-president badge to President Bentley.

It is proposed to extend the Laokai-Yunnan line, China, to Luchow.

DAVID FRANCIS CRAWFORD.

David Francis Crawford, the newly-elected president of the American Railway Master Mechanics' Association, was born at Pittsburgh, Pa., in December, 1865, and was educated in the common schools and at the Pennsylvania Military Academy at Chester, Pa.

In 1885 he entered the shops of the Pennsylvania Railroad at Altoona as an apprentice, and continued there until 1889, when he was appointed inspector of the test department, holding this position until February, 1892. He was then sent to Fort Wayne, Ind., as assistant master mechanic, and continued as such until 1895. This was followed by a promotion to the office of assistant superintendent of motive power, which he filled until 1899, when he became superintendent of motive power. In 1903 he was appointed general superintendent of motive power of the Pennsylvania Lines West, with headquarters at Pittsburgh, where he is still located.

This outline of Mr. Crawford's career would give but a faint idea of his activities without some account of the related matters with which his name is associated. While superintendent of motive power at Fort Wayne he was in responsible charge of designs and construction of a number of electrical power plants which probably paved the way for his appointment on the committee in charge of the electrification of the New York terminal, as well as that charged with the designing of the electric locomotives in use at that point.

Of course, during the whole of his career he has been closely associated with locomotive and car development on the Pennsylvania Lines West. Probably the most spectacular piece of work, and one which has attracted the greatest attention, is the designing of the heavy Pacific locomotives, used on heavy fast passenger service, upon which the men have bestowed the sobriquet of "Fat Annie." At the time of its construction the "Fat Annie" carried the heaviest load on the driving wheels of any passenger locomotive. This weight was 29,500 lbs. The engine was built as an experimental machine to provide for the future increase in train weights, and after three or four years of preliminary trial, has been ordered in considerable numbers.

Another matter with which Mr. Crawford's name is associated is that of the development of the underfeed mechanical stoker. This was a work to which he devoted a great deal of close personal attention for a number of years, and has succeeded so well that the machine is being rapidly applied to the locomotives of the Pennsylvania system, both east and west.

Outside the immediate work of his department, Mr. Crawford has been very active in supporting the railway position before the several legislative bodies that have had matters under consideration for the supposed benefit of the public. Two years ago he was one of the strongest opponents of the federal boiler inspection bill, which was under consideration at the time. He was also in the forefront of the struggle regarding the safety appliance act, which resulted in exclusion from its provisions of a number of objectionable features.

About two years ago the Indiana state railway commission issued an order to the railways of the state that all locomotives should be equipped with what was interpreted by some to mean a high, powerful headlight. Mr. Crawford was largely instrumental in having an elaborate investigation made as to the actual working of such a headlight, an investigation which resulted in the courts declaring the order void.

Mr. Crawford is a member of the American Society of Mechanical Engineers, of which he is one of the managers; the Institute of Electrical Engineers, the American Society for Testing Materials, as well as the local railway clubs and, of course, the Master Car Builders' Association. He is on the committee of maintenance of the American Railway Association, and of the statistical committee on railway account-

ing of the same association, on which he is the representative of the Pennsylvania Railroad.

While these do not cover all of the activities in which Mr. Crawford is interested and engaged, they will serve to show their wide range and the position which he occupies in the railway business.

R. S. M. A. EXECUTIVE MEETING.

At a meeting of the Railway Supply Manufacturers' Association, held yesterday morning, John D. Conway was re-elected secretary. A resolution was also adopted to consolidate the offices of secretary and treasurer, which resolution will be submitted to the members and voted on by letter ballot.

M. M. HONORARY MEMBERSHIPS.

W. T. Smith, formerly superintendent of motive power of the Chesapeake & Ohio, and now retired, was yesterday elected an honorary member of the M. M. Association. Mr. Smith has been a member of the association since 1869, making a period of 43 years.

MR. BENTLEY'S CONDITION.

E. W. Pratt made the following statement in the convention yesterday:

"Mr. Chairman and Gentlemen—I have just come from Mr. Bentley's room, and I think you will be glad to know that the doctor who is there says that he can in all probability get out of bed to-morrow, and within a day or two after proceed home.

"I did not know that I would be called upon to make any expression for Mr. Bentley, and have not been delegated to do so, but I want to assure you that he said over and over again if anyone could be killed by kindness, he believes he would be dead by this time, he has had so many kind inquiries, direct and indirect, from the members of this association, and others, and I think the sympathy and feeling we have had in our hearts has got to him in other ways. He feels very grateful to all of the members for the very large attendance at this meeting, which was a matter which was very dear to his heart; for the very thorough discussion of the papers, as others and myself have told him that it was a good convention, and that we had not any of us overlooked

FORMER EMPLOYEES OF THE CHICAGO & NORTH WESTERN.

Top row, left to right—F. W. Peterson, Master Mechanic, Chicago & North Western; G. F. Slaughter, American Steel Foundries.

Second row from top—B. R. Moore, Superintendent Motive Power, Duluth & Iron Range; M. C. Beymer, American Arch Company; J. A. Kinkead, Parkesburg Iron Co.; John L. Nicholson, American Arch Co.

Third row from top—F. M. Whyte, New York Air Brake Company; George R. Henderson, Consulting Engineer; George L. Bourne, Locomotive Superheater Co.; Henry D. Kelley, Goldschmidt Thermit Company; John P. Neff, American Arch Co.; John T. Carroll, Assistant General Superintendent Motive Power, Baltimore & Ohio.

Bottom row—G. W. Kelly, Master Blacksmith, Central Railroad of New Jersey; George Wagstaff, American Arch Company; W. G. Wallace, American Steel Foundries; Edgar B. Thompson, formerly Superintendent of Motive Power, Chicago, St. Paul, Minneapolis & Omaha; E. J. Arlein, W. H. Coe Mfg. Company; J. W. Kelly, National Tube Company; J. A. MacRae, Mechanical Engineer, Michigan Central.

the part, the very active part, which he played in the planning and preparation of the convention this year.

"Mr. Bentley also wanted me to thank, which I have done, individually the presiding officers of the convention, and it is unnecessary for me to say that he regrets very deeply that he should have been unable to preside, and I know we are sorry, too, because of his well-known enthusiasm and vigor in all matters connected with the administration of the affairs of the association, that he is unable to be with us." (Applause.)

A 600-1200 VOLT DIRECT-CURRENT FREIGHT LOCOMOTIVE.

A standard gage electric locomotive weighing 94 000 lbs. has recently been added to the rolling stock of the Oakland, Antioch & Eastern for handling freight trains. This system when completed will make a net work of lines totaling about 156 miles in the vicinity of Oakland, Calif.

The mechanical parts of this locomotive were furnished by the Baldwin Locomotive Works, and the electric equipment was furnished and installed by the Westinghouse Electric & Manufacturing Company. It is of the double truck type with raised center cab, and is arranged for operation in either direction. It can traverse curves of 50 ft. radius when hauling a trailing load.

The trucks are of the equalized pedestal type, with one-piece forged iron frames and rigid cast steel transoms. The transom gussets have ample bearings on the frame and transom, and act as brake lever guides and brake shoe hanger supports. The brakes are inside hung, and are applied through a radial beam, which is supported on the inner end of the truck frame. The wheels have cast iron plate centers, with steel tires shrunk on and bolted.

The locomotive frame is of the built-up type, composed of commercial shapes as far as possible. The longitudinal sills are four 12 in. channels. Between the middle and outer channels there is, on each side, a strong arrangement of diagonal braces of 6 in. channels. The end bumpers are of steel plate, ⅞ in. thick and 29¾ in. deep. The draw castings, of steel, are riveted in place between the center sills and back of the bumpers, and are arranged to take long-shank radial couplers of the M. C. B. type. The bolster plates, over the trucks, are 66 inches wide, and are substantially braced to provide the necessary stiffness.

This locomotive is fitted with air sanders, having spouts to all the wheels; combined air and hand brakes; two air whistles, and two electric headlights. The principal dimensions are as follows:

Truck wheel-base	7 ft. 4 in.
Total wheel-base	25 ft.
Distance between truck centers	17 ft. 8 in.
Driving wheels, outside diameter	42 in.
Width over all	10 ft.
Height to top of cab	12 ft.
Actual total weight	98,100 lbs.
Estimated weight of mechanical equipment	57,000 lbs.

For propulsion, there are four Westinghouse 120 H. P., 600-1200 volt commutating-pole railway motors, with a gear ratio of 19 to 54. This motor is of the slow speed type and particularly adapted to freight haulage.

Direct Current Freight Locomotive—Oakland, Antioch & Eastern Railway.

The HL unit switch type of control is used. The motors are connected in series and parallel with each other in conjunction with the necessary resistance to produce smooth acceleration on either 600 or 1200 volts operation. A hand-operated change over switch is used to change the main circuit from 600 to 1200 volts or vice versa. On 1200 volts the motors are operated four in series and four in series parallel. On 600 volts they are connected for operation with four in series parallel and four in parallel. A motor-generator furnishes low voltage for supplying the lighting and control circuits.

This locomotive will exert a tractive effort of 16,700 lbs. at approximately 10 65 m.p.h., and with a clean dry rail, a maximum tractive effort of 23,500 pounds as possible with this locomotive.

M. M. AND M. C. B. PAST PRESIDENTS.

M. M. ASSOCIATION.

H. M. Britton	1868-1876
N. E. Chapman	1876-1880
J. N. Lauder	1880-1882
Reuben Wells	1882-1884
John H. Flynn	1884-1885
J. Davis Barnett	1884-1885
J. Davis Barnett	1885-1886
William Woodcock	1886-1887
Jacob Johann	1886-1887
J. H. Setchel	1887-1889
R. H. Briggs	1889-1890
John MacKenzie	1890-1892
John Hickey	1892-1894
W. Garstang	1894-1895
R. C. Blackall	1895-1896
R. H. Soule	1896-1897
Pulaski Leeds	1897-1898
Robert Quayle	1898-1899
J. H. McConnell	1899-1900
W. S. Morris	1900-1901
A. M. Waitt	1901-1902
G. W. West	1902-1903
W. H. Lewis	1903-1904
P. H. Peck	1904-1905
H. F. Ball	1905-1906
J. F. Deems	1906-1907
William McIntosh	1907-1908
H. H. Vaughan	1908-1909
G. W. Wildin	1909-1910
C. E. Fuller	1910-1911

M. C. B. ASSOCIATION.

I. W. Van Houten	1867-68-69, 1873
F. D. Adams	1870-1871
M. C. Andrews	1872
Leander Garey	1874-1885
B. K. Verbryck	1885-1887
William McWood	1887-1890
Jno. Kirby	1891-1893
E. W. Grieves	1893-1895
J. S. Lentz	1895-1897
S. A. Crone	1897-1899
C. A. Schroyer	1899-1900
J. T. Chamberlain	1900-1901
J. J. Hennessey	1901-1902
J. W. Marden	1902-1903
F. W. Brazier	1903-1904
W. P. Appleyard	1904-1905
J. E. Buker	1905-1906
W. E. Fowler	1906-1907
G. N. Dow	1907-1908
R. F. McKenna	1908-1909
F. H. Clark	1909-1910
T. H. Curtis	1910-1911

There are requests from British interests in China for concessions to enable British interests to open connections with India and Burma and with India through Tibet. These connections would be of international importance. The engineering difficulties are said to be numerous and all but insurmountable. The connection from Szechwan province through Tibet is proposed with the idea that it can follow the caravan and trade routes from Chungking west to Batang south along the caravan routes now used to transport goods from India to Tibet. This caravan service connects with a special steamer sailing at stated periods from Glasgow, Scotland, with British goods for this trade. The light railway from Bahmo to Tengyueh is a portion of this transportation system. The Tibet route seems to be offered as an alternative route to the connection between Tengyueh and Yunnan.

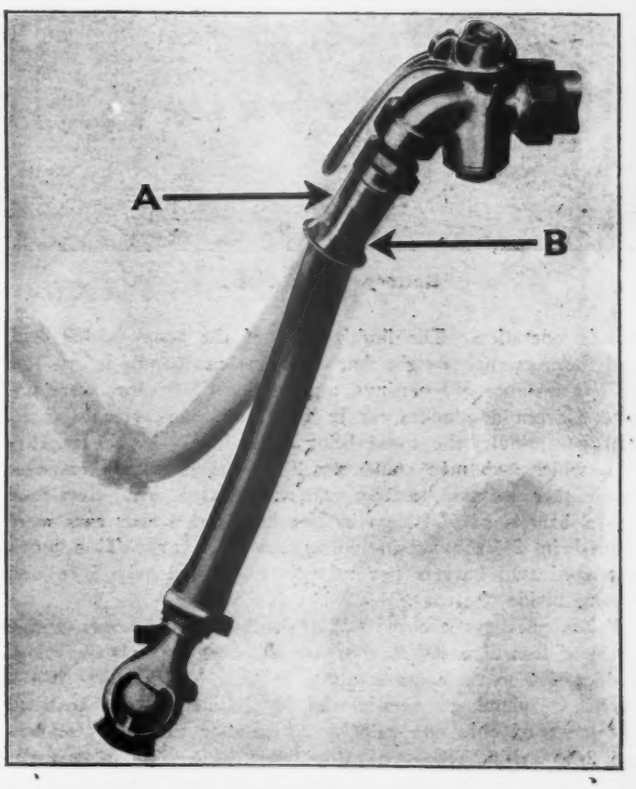
The Exhibit.

INDIRECT LIGHTING WITH THE PINTSCH MANTLE.

One of the serious objections to indirect lighting is the fact that approximately 50 per cent. of the initial candle power of the fixture is absorbed by this method. This objection is serious when considered in connection with electric lighting of railway cars, since all of the available wattage is needed to supply sufficient illumination by the old direct lighting method. The Pintsch mantle, however, has a higher initial candle power, and for that reason should prove efficient in connection with indirect lighting. To those who prefer this method of illumination to the direct system, any arrangement whereby the Pintsch mantle can be successfully employed indirectly, should be a welcome addition to the field of railway car illumination. The Safety Car Heating & Lighting Company, New York, has been conducting extensive tests and experiments along this line, and have announced their success in developing an indirect lighting fixture for use with the Pintsch mantle. This company had expected to be in a position to exhibit one of these fixtures at Atlantic City, but one or two unforeseen defects had to be remedied, which delayed the final completion of the fixture. Whether or not indirect lighting for railway cars will continue to be used, it is interesting to know of the final success of this Pintsch mantle indirect lighting fixture.

AIR HOSE PROTECTOR.

The illustration shows the application of the Universal air hose protector, made by the McCord Manufacturing Company, Chicago, Ill., which is designed to especially protect the hose from damage at the end of the nipple. *A* indicates the lower end of the air hose nipple. It is at this point that a very large percentage of air hose fails, caused by injury to, and the perforation of, the inner tube, as



Air Hose Protector.

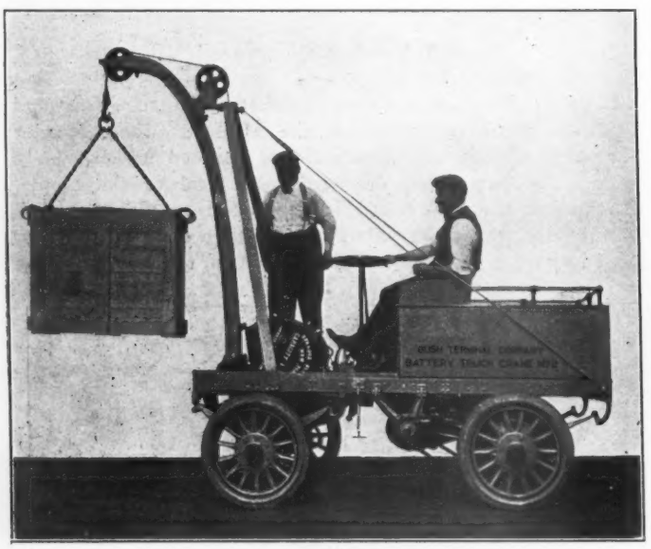
well as, in many cases, by being injured on the outside. In the latter case, the action of the elements on the bruised outer portions deteriorates the whole structure of the hose. The Universal air hose protector is a rigid section, formed with a bell-shape at the lower end, effectively supporting the hose at the required distance below the nipple end, properly protecting and relieving the usual strain.

Examination of condemned hose shows the tube to be in perfect condition from a point indicated by arrow *B* down to the coupling. This protector shields and protects all the portion of the hose above arrow *B*, entirely relieving the strains and resultant deteriorating effects, prolonging the life of the hose equal to that of the lower portion. Several thousands of these protectors are in use with satisfactory results.

BATTERY TRUCK CRANE.

The battery truck crane is designed for service in railway shops, freight houses, warehouses, terminals and docks, in short, anywhere where cars or lighters are loaded and unloaded; where packages weighing less than one ton are moved less than 400 feet; or where a number of heavy packages are moved over a greater distance. As an instance of their value, it is estimated that these machines earn each year 288 per cent. of their first cost at the Bush Terminal Company, New York.

For loading and unloading cars, the machine is brought to an advantageous position, the brakes are set and the hoist is



Battery Truck Crane.

put in operation. The limiting arc of the boom is 180 deg., and the maximum weight that the crane can handle is one ton. In one instance 360 castings, aggregating 65,000 lbs., were unloaded from a gondola car in five hours, an average of 1.2 lifts per minute, the speed being limited only by the rapidity with which two men could attach the slings to the castings. In another instance, a box car was loaded with sixty-four 800-lb. barrels of plumbago in 25 minutes, and four cars were loaded in 2½ hours, including spotting cars. This work averaged two barrels per minute, hoisted nearly 5 ft. and swung inside the cars.

When packages are moved in small quantities over a distance of less than 400 ft. they are attached to the hook, raised and carried to their destination. By this method sixty 800-lb. barrels of plumbago were moved 300 ft. in one hour with the assistance of only one helper. At another time one hundred and fifty 300-lb. boxes of rubber were loaded into a box car 75 ft. away in 50 minutes; three boxes were slung together and a round trip was made every minute. In a storeroom, boxes of angle and flat iron, weighing 10,000 lbs. each, were carried 30 ft. and stacked at the rate of 40 boxes an hour.

The machine has proven most economical in transferring large quantities of miscellaneous package freight over distances greater than 400 ft. In this class of service trains of about four trailers are attached to the battery truck crane, three trains of trailers being assigned to one battery truck, one train at loading point, another en route and the third being unloaded at the destination. Horses are used to make up the trains and to spot the trailers, and the men at each end are kept constantly busy. An average of 30 tons of freight an hour can be moved one-half mile by this method. The maximum load per train is six tons. In one instance, 600,000 lbs. of cotton were carried one-half mile in ten hours at the rate of twenty-four 500-lb. bales per load and a round trip every 12 minutes, an average of 1,000 lbs. per minute. On small package freight, using two trailers to the train, one battery truck crane moved 1,000,000 lbs. 600 ft. in 19 hours.

The machine consists of a short, heavy storage battery vehicle, having a swinging crane mounted on its forward end. The crane hook is raised and lowered by a hoist operated from the battery. It has a maximum drawbar pull of 2,000 lbs. The speed is nine miles an hour with a light load, seven miles an hour with one ton on the hook, and five miles an hour with five tons on trailers. The gage is 60-in. and the wheel base is 64 in., which permits the machine to make sharp turns. The weight is 5,000 lbs. The General Electric Company's universal type of automobile motor is used. The torque increases in direct proportion to the current increase without causing a material decrease in efficiency when the motor is exerting extra power. Continuous torque control is the characteristic feature of the controller, which assures starting and acceleration by gradual easy steps and eliminates the jerky movements which are detrimental to the transmission. The hoist has a maximum lifting capacity of one ton 20 ft. per minute with the pulley and double cable, or 40 ft. per minute with the single cable. The hoist is entirely enclosed and weatherproof. The drum has a winding capacity of 35 ft. of cable. The charging of the batteries may be tended by a watchman during the night. The machine can negotiate steep grades and can travel easily over the roughest pavements. The upkeep is cheap and an operator can be made of a common truckman receiving 20 cents an hour.

The battery truck crane is made by the General Electric Company, Schenectady, N. Y.

GRINDING WHEEL RECORDS.

The Carborundum Company, Niagara Falls, N. Y., has recently collected some data concerning the uses of its Aloxite and carborundum wheels. The Aloxite wheels are used for grinding reamers, cutters and general high speed tools, while the carborundum wheels are used for heavier work, such as car wheels, etc. In one railway shop on a large Southern system the tool room foreman has used a 10-in. Aloxite wheel for over five months and in that time it has only lost 2 in. and has not been touched with a dresser. This wheel ground two 2¼ in. drills of mushet steel from the rough stock, losing only 3/16 of an inch. The drills were 26 in. long and were made in the blacksmith shop being twisted from plain stock. In this same shop a 12-in. Aloxite wheel cut a piece of 2¼ in. x ⅝ in., in 55 seconds.

It was also shown that in another shop, car wheels were ground for less than one cent apiece with carborundum wheels. The report submitted from this shop showed that 28 carborundum wheels ground 54,456 car wheels. In another shop one carborundum wheel is credited with 1,348 wheels before it wore out. The exhibit of the Carborundum Company is located in Machinery Hall, where their grinding wheels will be working under actual shop conditions. The exhibit is equipped with a universal grinder, a heavy floor grinder, a drill grinder and a cutting-off machine.